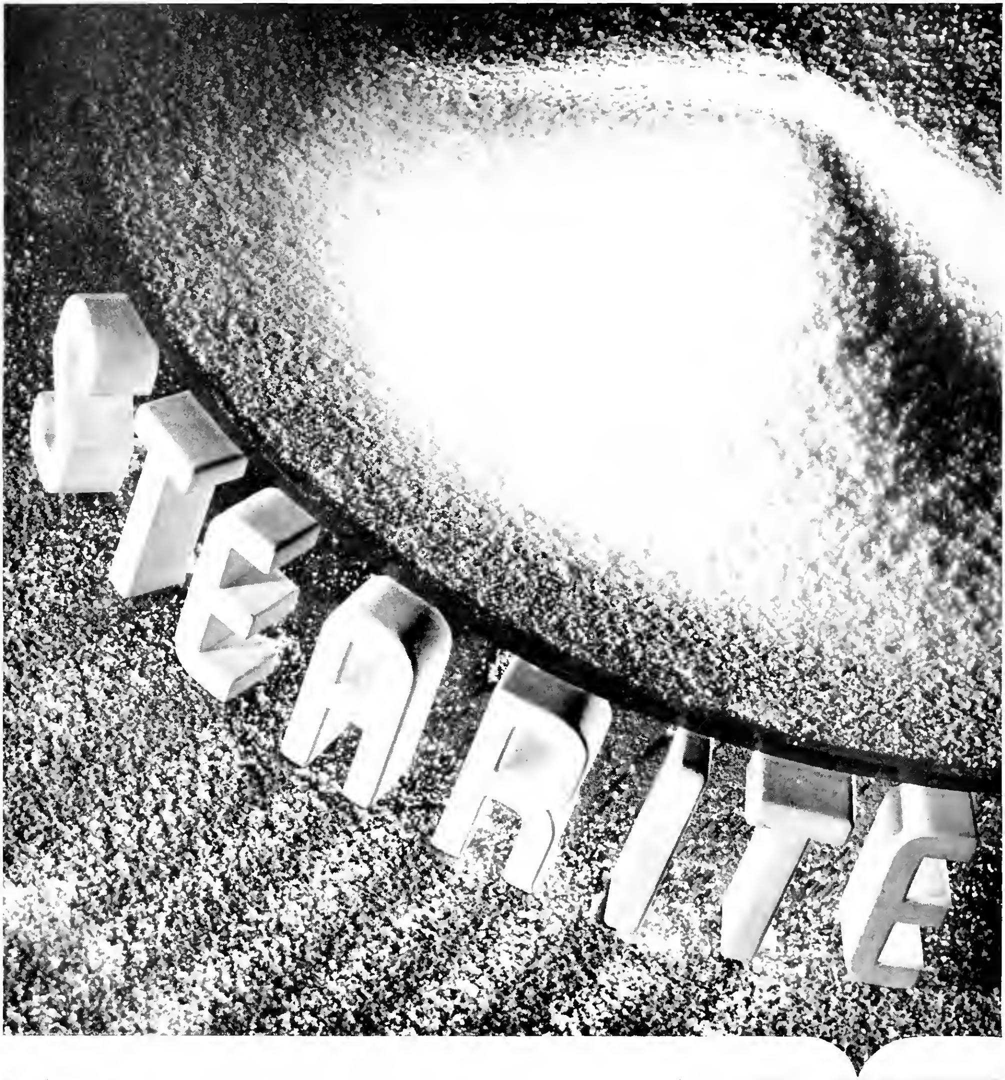
ILLINOIS TECH ENGINEER

AND ALUMNUS

OCTOBER, 1941


STEARITE

G-E Campus News

I KNOW!

IF THE steel for an automobile travelling between Chicago and Los Angeles at 60 mph was cold-rolled at a speed of 42 mph, how far is it from Bangor, Maine, to Bankok?

So far as we know there's no answer to this problem. But then, a few years ago there was no answer to the problem of cold-rolling steel strip at these speeds either.

G-E amplidyne control solved this problem, enabling a Pennsylvania steel plant, the largest, highest-powered cold-rolling mill for tin-mill products in the world, to roll out strip at speeds up to 3850 feet per second, or more than 43 miles per hour!

G-E motors to the tune of 11,400 hp respond to the precision control of G-E amplidyne circuits in driving the rolls of the mill at this speed.

TELEBOX

WHEN Dame Nature goes to work on a television antenna with rain, sleet, and snow, she can cause no end of transmission trouble.

G-E television engineers, however, circumvent weather changes by housing the antenna within an electrically heated box. This prevents seeping moisture from freezing on the antenna during cold weather and interfering with the normal patch of high-frequency current flow.

The antenna, at the top of a 128-foot transmitting tower in the heart of Schenectady, relays the picture waves to G.E.'s main transmitting station in the Helderberg hills 12 miles away.

On top of the box for relaying the accompanying FM sound is another antenna which also acts as a lightning rod to protect the tower and relay equipment.

RESEARCH INC.

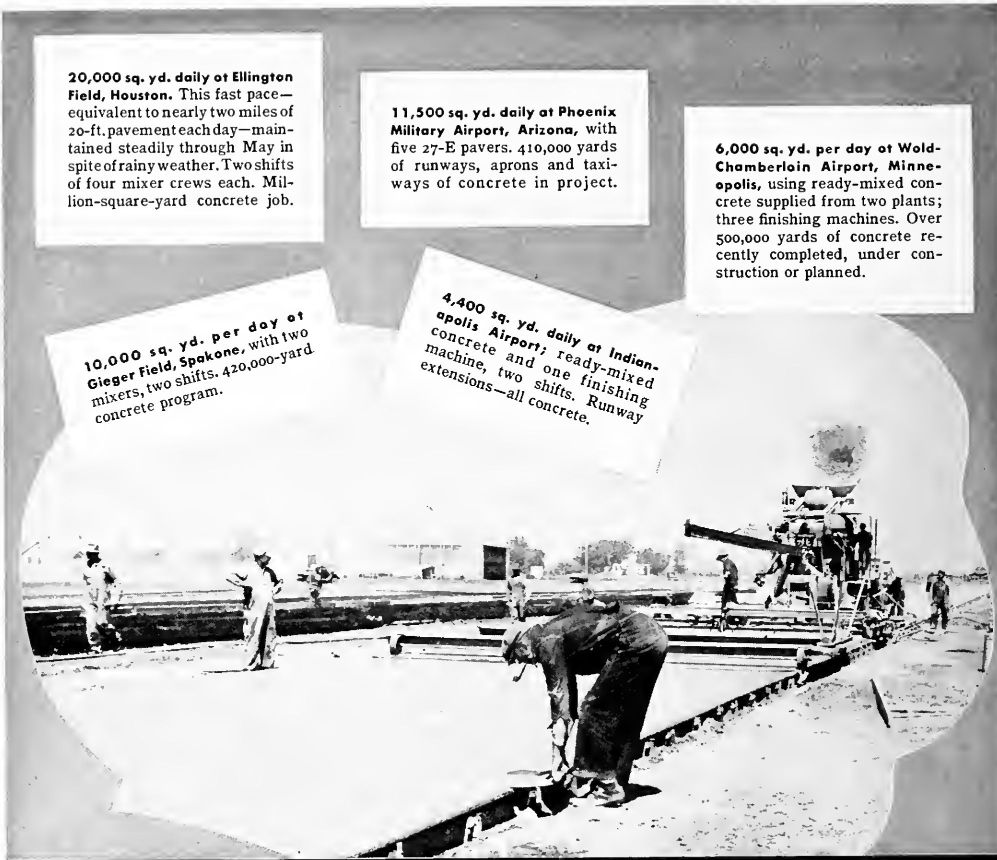
HOW a heavy English bulldog and a brawny Irish washerwoman substantiated the findings of years of research is described with an order for fifty miles of Formex wire recently received by General Electric.

The customer was considering the use of Formex wire as a substitute for wire whose insulation had rotted after two or three years of use, exposing the bare copper. The railroad's signal engineer was "from Missouri" and wanted to see for himself whether Formex wire insulation could "take it."

Two 50-foot lengths were strung up. One was equipped with a metal ring, to which a bulldog was attached on a leash. The other became a washerwoman's clothesline. Several weeks later, after the bulldog had tugged against every inch of his wire and the washerwoman had pinched her wire with clothespins from end to end, the insulation of both lengths was still in perfect condition.

GENERAL ELECTRIC

963-24-211


20,000 sq. yd. daily at Ellington Field, Houston. This fast pace—equivalent to nearly two miles of 20-ft. pavement each day—maintained steadily through May in spite of rainy weather. Two shifts of four mixer crews each. Million-square-yard concrete job.
11,500 sq. yd. daily at Phoenix Military Airport, Arizona, with five 27-E pavers. 410,000 yards of runways, aprons and taxiways of concrete in project.
6,000 sq. yd. per day at Wold-Chamberlain Airport, Minneapolis, using ready-mixed concrete supplied from two plants; three finishing machines. Over 500,000 yards of concrete recently completed, under construction or planned.
10,000 sq. yd. per day at Gieger Field, Spokane, with two mixers, two shifts. 420,000-yard concrete program.
4,400 sq. yd. daily at Indianapolis Airport; ready-mixed concrete and one finishing machine, two shifts. Runway extensions—all concrete.

Contributors

Horatio Bond was graduated from the Massachusetts Institute of Technology in 1923. Following graduation, he spent a year as assistant to Professor E. H. Schell, head of the Department of Business Administration at the Institute, and joined the staff of the National Fire Protection Association in 1924.
Mr. Bond is Chief Engineer and in charge of the field service of the Association. As a field representative, he has visited practically all of the principal cities of the United States to study local fire conditions. He has made numerous special surveys, notably a six-months' study of the fire situation in the City of Boston in 1929, and a fire survey of all the U. S. federal civil prisons for Director Sanford Bates in 1933. He is editor of VOLUNTEER FIREMEN, the fire department magazine with the largest circulation, and is the author of numerous technical papers in the fire field. He prepared the text for an extension course in Fire Administration issued by the International Association of City Managers in 1935 and was editor of a 232-page text on the subject of Fire Defense this year.

Henry P. Dutton is Professor of Business Management; Chairman, Department of Industrial Engineering; and Dean, Evening Division.

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John Day Larkin is Associate Professor of Political Science; and Chairman, Department of Political and Social Science.

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ILLINOIS TECH ENGINEER
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IN THIS ISSUE

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THE FIRE PROBLEM OF DEFENSE

By
HORATIO BOND

The fires which have been started in English cities by German air attacks have demonstrated that fire is one of the most important problems of the war. Observers appear to agree than the principal damage was done by explosive bombs and it also appears that these bombs set many disastrous fires. Many of the fires, of course, were set by incendiary bombs, but to everyone's surprise the incendiaries were readily taken care of by citizens. Most of them were small in size and only a small proportion apparently started serious fires. The bad fires appear to have occurred in buildings and structures where a fire starting from any cause would have been a serious one.

Large fires are likely to be started wherever a city is subject to a destructive bombardment. One surprising thing, however, is that fires in London and other English cities have been localized to a considerable degree. The value of fire walls and other barriers to the spread of fire has been apparent. Private fire protection has apparently given a good account of itself. A report, for example, mentions that there has not been a serious factory fire started by an incendiary bomb in any plant where the building was protected with automatic sprinklers.

We may speculate how our American cities would stand up if subjected to such an attack. Well protected industrial plants which are sprinklered or have other forms of private protection would be likely to stand up well with damage limited to those parts directly hit by explosive bombs. Pier and wharf warehouses, as in London, are likely to be wiped out if a fire starts in them from an incendiary or other type of bomb. The principal mercantile districts of cities are likely to be decimated by direct hits of explosive bombs and by incendiary

Factory Mutual Laboratories

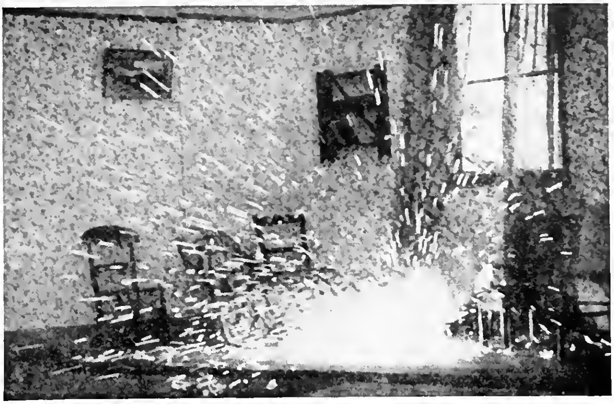
At High Temperatures, Magnesium Reacts Violently With Water, Producing Hydrogen

bombs which start fires in buildings which, because of their construction and arrangement, are conflagration breeders. The residential districts of most American cities, however, should escape trouble from all but direct hits. It is not likely that incendiary bombs would cause more than the destruction of an isolated residence here and there because most American cities have few combustible roofs left to cause a sweeping fire in a residential area. However, in residential districts of cities in which wooden shingle roofs prevail or where there is inadequate separation between wooden buildings, sweeping fires may well be expected.

Fire is equally destructive to national resources and vital defense products whether it is due to an incendiary bomb or some accidental cause. Fires take tremendous annual toll of life and property and in times like these may seriously handicap war activities, particularly where production facilities in bottle-neck industries are involved, or where the fires destroy important stores of raw material or finished goods that cannot be readily replaced.

Fires in the United States last year took a toll of some 10,000 lives and $300,000,000 worth of property damage, not counting the various important indirect losses due to interruption of production, loss of employment and disruption of business. The loss experience this year is likely to be substantially worse due to the increased volume of industrial production. An epidemic of large fires began in May of this year, one of the most important of these being a $5,000,000 fire in Jersey City which destroyed a stockyard, two large wharf structures, a grain elevator, a seven-story concrete warehouse and numerous barges and freight cars. This fire, and every one of the major fires of this year, or any year, can be shown to have been due to failure to observe one or more important principles of fire protection.

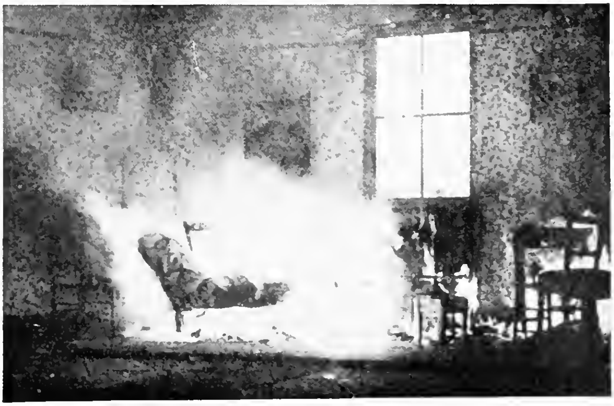
The general principles of protecting factories, warehouses, or other important properties, are simple to understand in their broad outline. If, for example, there is a large amount of material to burn in one place, a large fire is to expected, so the amount of combustible material in one place should be as small as possible. For putting out fires that may start, water in adequate quantities is necessary. In a few cases, there are types of fire to be dealt with that cannot be put out with water and for these special extinguishing agents are needed. Most fires can be prevented from starting through the maintenance of good conditions, especially with respect to ordinary housekeeping. Prompt dealing with small fires can be assured by watchmen, alarm systems and first aid fire appliances. These in their barest forms are the principles involved in protecting industrial plants. The same principles apply to important buildings and structures everywhere.



One-Kilogram Magnesium Bomb Fifteen Seconds After Ignition

It is essential that it be clear that fire prevention is something more than posting "No Smoking" signs and that fire protection is more than providing extinguishers or throwing water. In the practical business of making industrial plants safe from fire there is a mass of technical information which must be applied. This specialized knowledge is the professional equipment of the fire protection engineer. Since 1903, Armour has maintained a separate department of fire protection engineering with a four-year curriculum leading to the degree of Bachelor of Science in this branch of engineering. Unfortunately, fire protection engineering education has not developed to the point where the average architect or engineer receives much training in fire protection engineering matters and the usual field experience of engineers and architects doesn't develop much background of practical experience for them. The consulting engineer or architect follows the local building code or insurance engineer's recommendations and I am sorry to say that these re-

One-Kilogram Magnesium Bomb Forty-Five Seconds After Ignition



quirements and recommendations are too often followed blindly. The situation is such that the engineer feels he is required to comply with the building code or to follow some insurance engineer's requirements anyway and he therefore has no incentive to inquire very much into the background of fundamentals from which these requirements and recommendations are derived.

A word of caution is therefore in order to the engineer or architect, without specialized fire protection experience, in his dealings with fire problems. The commonest mistake likely to be made is to allow too much value to be concentrated subject to destruction in a single fire without providing compensating protection. This mistake has already been made in the design of some of our manufacturing plants, notably the airplane manufacturing plants. Production men, architects and construction engineers, without much background of fire experience got the buildings up before fire protection men had been given a chance to say much about them.

On April 1, a fire occurred in Elizabeth, N. J., involving a loss which may run to half a million dollars, which illustrates the specialized character of the experience needed to avoid major losses. The fire in question occurred in a modern "fireproof" warehouse, fully protected with automatic sprinklers and certain accessory features for automatically reporting a fire promptly. All of this protection worked admirably and there was also strong municipal fire department protection which functioned at full efficiency.

The fire was in three large piles of baled sisal and hemp which had been stored on the top floor of the warehouse. It had started inside of one of the piles of baled material. Water from sprinklers and hose streams could not reach the fire because of the excessive size of the piles. In the process of trying to drown out the fire, the entire contents of the top floor and four stories of the warehouse below it were wet down and the swelling of one pile of the fibres which had been placed against a division wall of the warehouse pushed this wall out of place.

An elementary point which any reasonably experienced fire protection engineer would know about was ignored in this case. The loss would have been trivial had the sisal been stored in piles, each pile being small enough so that if it took fire the seat of the fire could be promptly reached. Furthermore, such material should be stored on skids so that water used in extinguishing a fire might run off without wetting down all of the stored material on that floor and the floor below.

The war emergency is requiring that many persons who never before had to solve a fire protection problem must do so now. So far as possible, it is the wise course to secure counsel from experienced engineers. Some large industrial enterprises have such specialists as staff members. So do railroads, certain public utilities and the Army and Navy. Insurance company inspection boards and bureaus have men located in all important cities of the country who are very generous in the matter of giving such counsel and many large city fire departments have also established fire prevention bureaus with a staff of men whose background, while seldom that of engineers, nevertheless embodies a great deal of practical fire experience. There is also a standard reference work on fire protection engineering —the Crosby-Fiske-Forster *Handbook of Fire Protection,* a book of 1308 pages issued in a ninth edition in 1941 by the National Fire Protection Association.

In most industrial plants consideration has already been given to features of fire safety, as nearly all such plants are insured against fire. The plants are periodically visited by an engineer of the insurance company or of the group of companies carrying the insurance. These engineers have thoroughly inspected the plant. They have made a survey which includes a detailed plan of the property. This plan shows each building, its relation to others, location of fire walls, floor cut-offs, and other details of construction and arrangement. The contents of each building is noted including any process hazards of a special character. The plan also shows all details of water supply for fire protection, where the water comes from, quantities available from city mains, tanks and pumps, location of underground water mains in the factory yard, hydrants, valves, and connections to standpipes and sprinklers. There has been prepared in many cases also a list of desirable improvements. This list has been submitted to the management which has it on file. Thus the work of deciding what there is to do in any plant where special attention to protection becomes advisable because of war contracts has already been done in most cases.

The safety of a new plant from fire is principally determined by the thought that is given to it before it is actually erected. Fire safety cannot be assured by the use of so-called "fireproof" construction nor indeed by any single measure.

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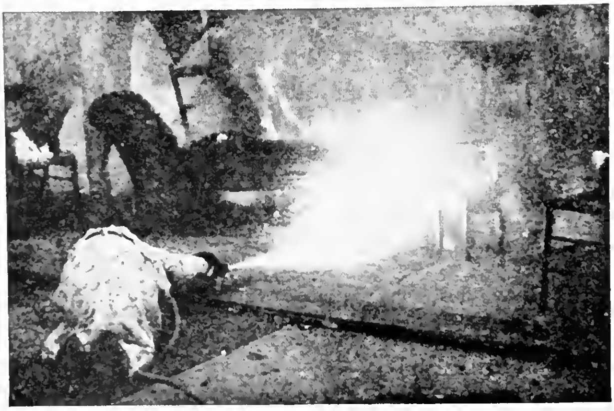
Water Being Sprayed On a Magnesium Bomb



This and two preceding pictures from Air Raid Precaution Handbook No. 9, British Government

SOIL MECHANICS

ON THE CHICAGO SUBWAY

By

RALPH B. PECK

The general features of the Chicago Subway Project have been described in previous issues of the Armour Engineer and Alumnus, particularly in articles by Mr. Joshua D'Esposito and Mr. Charles E. DeLeuw in March, 1939, and by Mr. Philip Harrington, in October, 1939. In the interval between the writing of these articles and the present time, the initial system of Chicago subways has become a reality with the completion of approximately eight miles of double-tube subway tunnels and most of the appurtenant structures. The program has been noteworthy for its rapidity of construction, combined with care in design and a safety record unusual for a construction operation of such magnitude. A further unusual aspect of the subway program has been the extensive series of measurements and observations carried out for the purpose of determining the previously unknown factors which entered into the design and construction of the project. An extensive program of field observations has been carried on since the beginning of construction which not only provided information of immediate usefulness in the subway work but also served to preserve the experience obtained in the project for the benefit of engineers engaged in similar work in the future.

In general the Chicago subway consists of two tunnels running side by side, each approximately twenty-two feet in diameter with their crowns approximately twenty-five feet below the street surface. Throughout most of the project the soil in which the subway is constructed is a plastic blue clay of variable stiffness, becoming especially soft in the downtown region where the presence of heavy buildings on spread foundations indicated a difficult engineering problem. The clay surface is usually found twelve or thirteen feet above the top of the tunnel, approximately at the elevation of Lake Michigan. Between the clay surface and the ground surface exists a pervious deposit of fill, sand, and silt within which the ground water level occurs, always above the elevation of the clay surface. Although the clay is saturated with water and possesses a water content in places as high as sixty per cent of the dry weight of the material, it is nevertheless quite impervious to the flow of water so that the construction of deep tubes does not require that large volumes of seepage water be removed during or after construction.

Few precedents were available for the construction of large-size tunnels under congested business districts in soft plastic clay. It was known that excavation of the soft clay was likely to result in a subsidence of the ground surface, but the exact influence of the type of soil, of the location of heavy buildings, of the depth of overburden, or of the details of construction operations on the magnitude of the settlement was not understood. It was known that during construction the temporary lining erected in the tunnels would be subjected to stress due to external pressures, but very little experimental data were available as to the magnitude of the expected pressures, or as to their distribution around the lining. In connection with the open cuts built on the project it was known that the lateral earth pressure would produce stresses in the bracing of the cuts, but no measurements were available for clay soils to determine the magnitude of the expected loads or the movements which might be associated with the excavation. In connection with the design of the permanent structure, no experimental information was available regarding the actual pressures which would be exerted by the soil against the structure. In all of these cases, theories existed from which the expected pressures could be calculated, but the validity of the theories had never been systematically tested by means of actual measurement and, therefore, absolute certainty could not be attached to the conclusions arising from their use. Until the experimental information became available, it was not possible to use the methods of soil mechanics on the subway project.

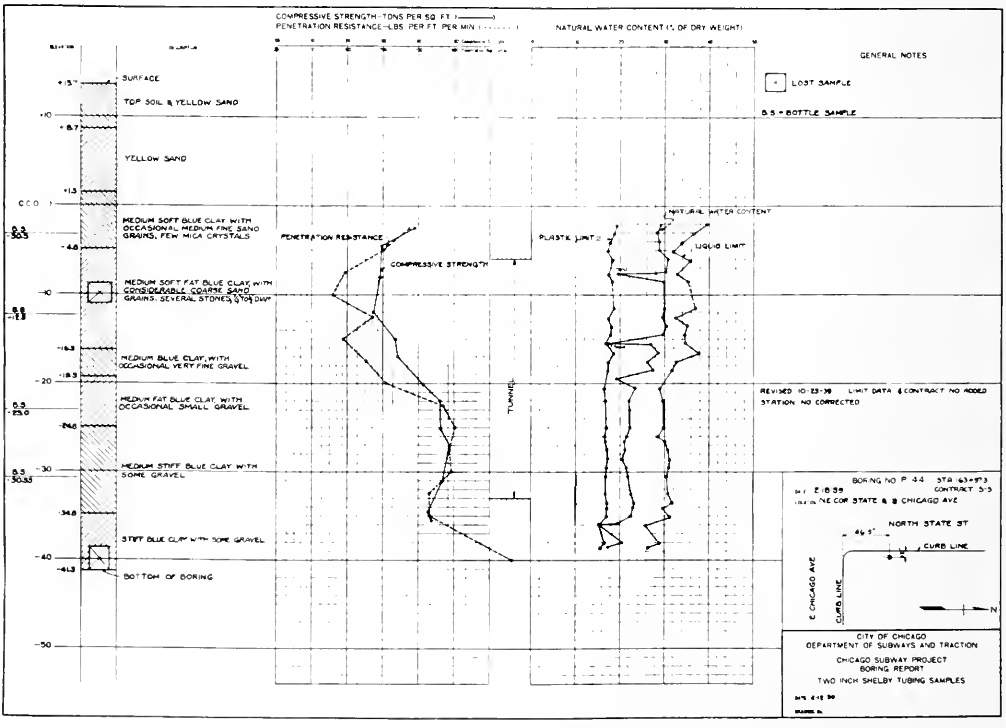
The removal of many of these uncertainties was possible as the experimental program developed. Inasmuch as the properties of the soil within which the structure was to be built were important in the evaluation of field measurements, an extensive series of borings was made along the subway routes and a soil-testing laboratory was established to test the samples from the borings, and to correlate the information. Continuous clay cores, two inches in diameter, from the clay surface to a depth of ten feet below the bottom of the tunnel were obtained at 300-foot intervals along the subway lines. The cores were transported in sealed containers to the laboratory where they were removed, described, and subjected to physical tests. For classification purposes the natural water-content of the samples was determined for every six-inch length of core, and, at least once in every two and one-

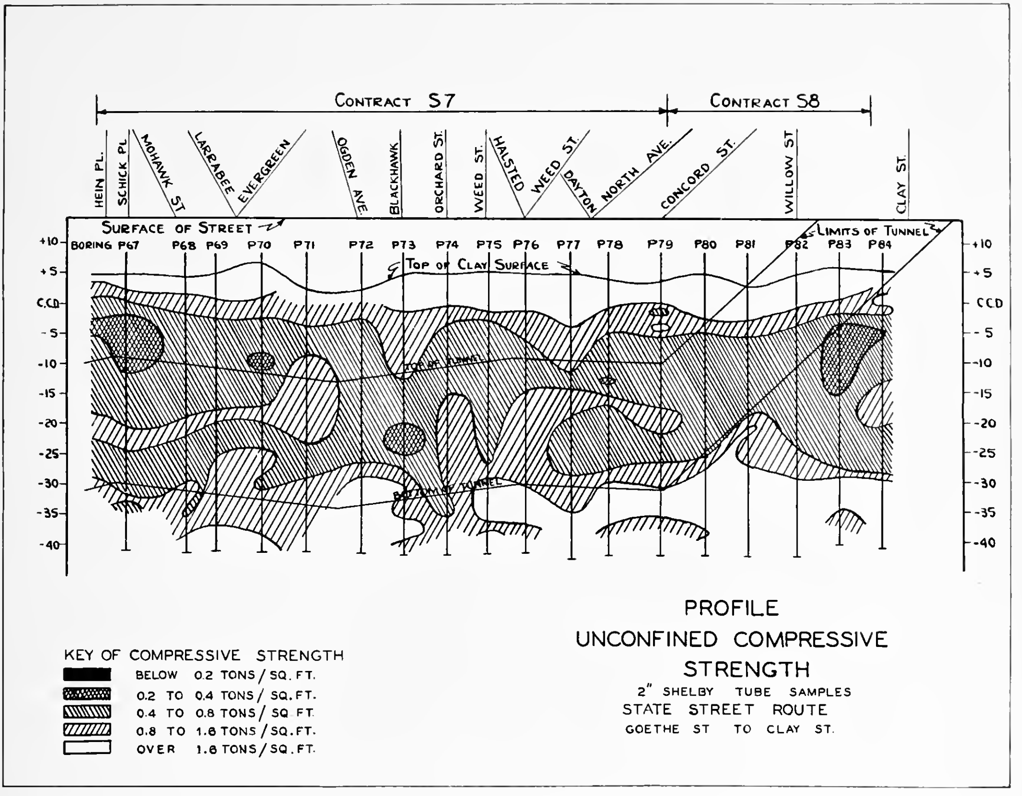
half feet, a sample was subjected to an unconfined compression test in a testing machine to determine some of the engineering properties. Numerous other tests which were necessary to determine the soil characteristics were performed, and results were assembled in the form of boring logs, and profiles of the consistency of the underground. This information served to tie together the results of field measurements on various parts of the system and to provide the necessary constants for subsequent theoretical analysis of the field test results.

Approximately five miles of the subway system, comprising that portion which was outside of the downtown area, was constructed under compressed air by hand-tunneling methods. In these cases the clay was simply carved from the face of the tunnel heading and carried away while light steel lining was erected as excavation proceeded. In the downtown area where the soil was softest and where even the remotest possibility of a collapse had to be eliminated, the shield method of tunneling was employed. The shields were large circular cylinders, propelled by hydraulic jacks through the clay, cutting the material as they went and permitting its removal within the protection of the walls of the cylinder. Since it was anticipated that some soil movements might occur in connection with both types of construction an elaborate system of settlement levels was developed by which the elevation of the street surface and the adjacent buildings could be determined at any time. Level-points were established on at least six points across the surface of the street above the tunnel at twenty-foot intervals throughout the length of the system, and in addition thousands of points were located on and within adjacent structures. Readings were taken on these points daily when construction operations were near, and upon occasion even more frequently. The results were plotted on large charts each day so that any unusual variations could be noted at once and proper procedures adopted.

Correlated with these surface observations a number of tests were made within the tunnels themselves to

Boring log showing the results of laboratory and field tests performed on soil from one of the 250 test borings made for the project.





Profile of soil stiffness as determined from unconfined compressive strength tests for subway borings on State Street route along Clybourn Ave. The variable nature of the underground is well illustrated.

determine the soil movement which resulted in settlement. In the case of the hand-mined tunnels, techniques were developed for measuring the inward movement of the clay walls as soon as they were exposed, the downward movement of the roof of the tunnel, and the inward movement of the working face even before mining had exposed a given block of soil. Special observations, by means of strain gages, were made to determine the stresses in the temporary temporary lining, and an accurate record was kept of the progress of excavation in all portions of the heading, together with all other details of construction. Such tests were carried out through at least one complete cycle of mining and lasted usually from twenty-four to seventy-two hours. The results of the progress and movement within the tunnel were then correlated with observed settlements on the street surface and it was often possible to recommend minor changes in construction procedure which effected a marked reduction in surface settlement. As a result of improved procedures developed in part by means of these observations, at the junction between one of the earliest and one of the latest contracts to be constructed, a reduction in settlement of two-thirds was apparent over the newer tunnels as compared to the older.

In connection with shield tunneling, it was found that advancement of the shield produced a small rise in the street surface which was followed by a settlement after passage of the machine. The process was repeated when the shield for the second tube arrived at a given cross-section. Levels were continuously taken on the street surface in front of the shields during shoving operations, and telephone communication enabled any movements of the street surface to be brought to the attention of the shield operator. Again a careful permanent record was kept of all of the movements of the ground surface associ-

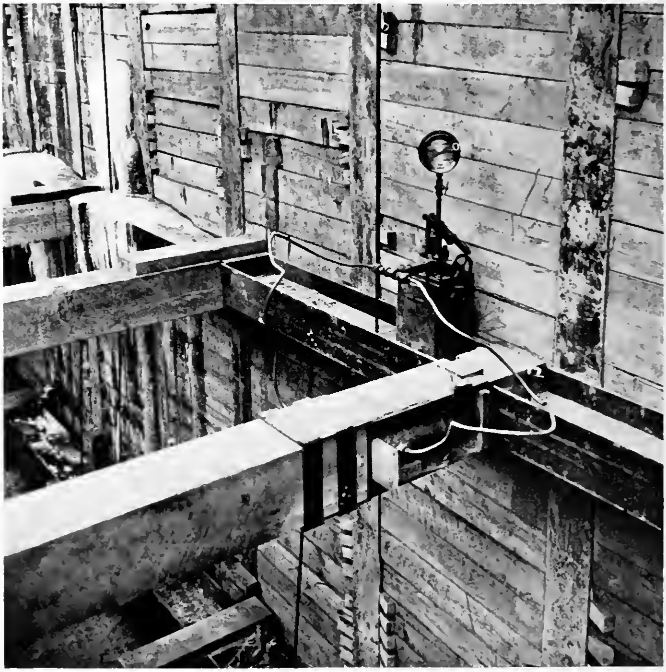
ated with the construction of the shield tunnels, and sub-surface reference points were established to determine the distribution of the movements below the ground surface. In addition, by the use of special pressure cells, the pressures transmitted through the soil from the shield against the footings and walls of adjacent buildings were experimentally determined and carefully correlated with the construction operations and jacking pressures used in the shield at the time the measurements were being carried out. In both types of tunneling, calculations were made to account for the volume of settlement during construction by the measured quantities below the surface. It was found that any subsidence of the street surface could be accounted for by the observations made within the tunnels. This fact convinced the contractors that care in construction operations would inevitably result in less movement of the ground surface, and was one of the means of arousing their cooperation.

A continuous station platform was constructed throughout the portion of the subway lying within the limits of the loop. Platforms were of the island type, located between the two train-tubes. They were constructed by careful excavation of the material lying between the two circular-shield tunnels which had been previously built side by side. The removal of material from between the tubes subjected them to unbalanced lateral earth pressure of unpredictable magnitude. Therefore, while the construction procedure was being established, extensive and careful measurements were made on the existing tubes to determine whether any detrimental movements took place. Measurements were made to determine the settlement, lateral motion, rotation, and state of stress in the lining accompanying the excavation process. The results made possible the establishment of a satisfactory procedure which involved no detrimental movements on the part of the completed structure.

In connection with the deep open cuts, usually approximately fifty feet in width and forty-five feet in depth, measurements were systematically made to determine the loads carried by the bracing systems. For cuts with steel bracing the use of a ten-inch Whittemore strain-gage was found to be satisfactory. When the bracing was constructed of timber, hydraulic jacks equipped with pressure gages were used to transfer the load from a portion of the struts to the jacks so that it could be measured. It was necessary in the latter case to provide the wooden struts with special shoes into which the jacks could be inserted. In all, the loads in approximately fifty profiles of bracing in open cuts of various dimensions and in soils of different stiffness were experimentally determined. The design of open-cut bracing was materially modified as the information accumulated. In particular it was found that, contrary to customary theory, the maximum earth pressure was not exerted at the bottom of the cut but near midheight and it was therefore sometimes possible for contractors to rearrange bracing in the lower part of the excavations to facilitate placement of the permanent structure. As information continued to accumulate, it was found that the magnitude of the earth pressures could be calculated from the soil properties by the use of the relatively recent general wedge theory for earth pressures after introducing a modification to provide for the cohesion of the soil. In connection with the open cuts it was also found that the sheeting used to support the sides of the excavation experienced an inward movement while mining was occurring, even before it was possible to insert bracing. This movement of the sides of the cut involved a subsidence of the ground surface adjacent to the excavation, and by continued observation of such movement it was possible to determine the location at which struts should be placed in order to reduce the settlement to the minimum possible value. In one open cut such continued observations and their application resulted in a fifty per cent decrease in settlement as the suggested procedures were adopted.

In all of the construction field-measurements, it soon became apparent to the contractors that the facts obtained were of considerable value and their voluntary cooperation in most of the measurements increased as the project developed. Eventually the contractors, seeking to improve features of construction, came to re-

Photograph showing steel attachment provided at the end of wooden strut to permit determination of the strut load by the use of hydraulic jacks.



Above: Photograph of bracing of typical open cut before experimental evidence had been accumulated.

Below: Photograph of bracing of open cut designed in accordance with the results of field measurements. In particular, note the clear working space in the lower portion of the excavation in which the permanent structure is being built.

quest observations on their own work to an extent which was not originally contemplated even by the members of the soil-testing section. As the knowledge became more complete, contractors preparing bids for the later contracts were able to improve their designs and construction procedures, and this resulted in a decrease in the prices bid on the contracts as time went by.

In order to obtain information which would be useful for the design of future extensions to the subway system, as well as to check upon the adequacies of the present design, two full-size test sections of the tunnel were constructed. One of these was located in the shield section and the other in a hand-mined section. In both cases the heavy reinforced-concrete lining customarily used was replaced by a relatively flexible steel lining equipped with devices for determining the external pressures against the section, the strains set up in the lining, and the distortions experienced by the tubes. Devices were also developed and installed to measure the water pressure in the soil surrounding the tubes so that its effects could be separated from the total earth pressure for purposes of theoretical analysis. The test sections were of ample size to eliminate any

statistical uncertainties in the measurements. In the hand-mined tunnel the section was twenty feet in length while in the shield tunnel the length was fifty feet. Observations were initiated at the time of construction and have been continued since that time to determine any alteration in conditions with the passage of time. It has been found that the distribution of stresses around the tunnel sections is actually more favorable than that which it had been necessary to assume for conservative design in the absence of such measurements. As a result, if the present indicated conclusions prove valid, a reduction may become possible in the amount of material now used to resist bending moments in the permanent structure.

The extensive series of field measurements made in connection with the Chicago subway, together with the determination of soil properties in order to assist in the correlation of the information, represents the application of soil mechanics to the Chicago subway. It might be pointed out that the soil-mechanics program did not include speculations regarding the possible behavior of the subway structures, nor did it include calculations based upon elaborate theories. As a matter of fact, for the greater part of the program, the place of theory was restricted solely to pointing out those quantities and properties which should be measured because they would be likely to be of importance in the interpretation of the results. This function of theory was, however, of great importance. The current popular opinion of soil mechanics, which considers it as a highly theoretical and speculative subject, was certainly not correct in the actual application of soil mechanics to this particular project. The correlation of data involved the generalization of information and the introduction of theories of soil behavior, but it is important to realize that the theoretical considerations were developed subsequently to the determination of the actual measurements and facts.

In addition to the direct benefits to the subway organization itself, obtained from the program of measure-

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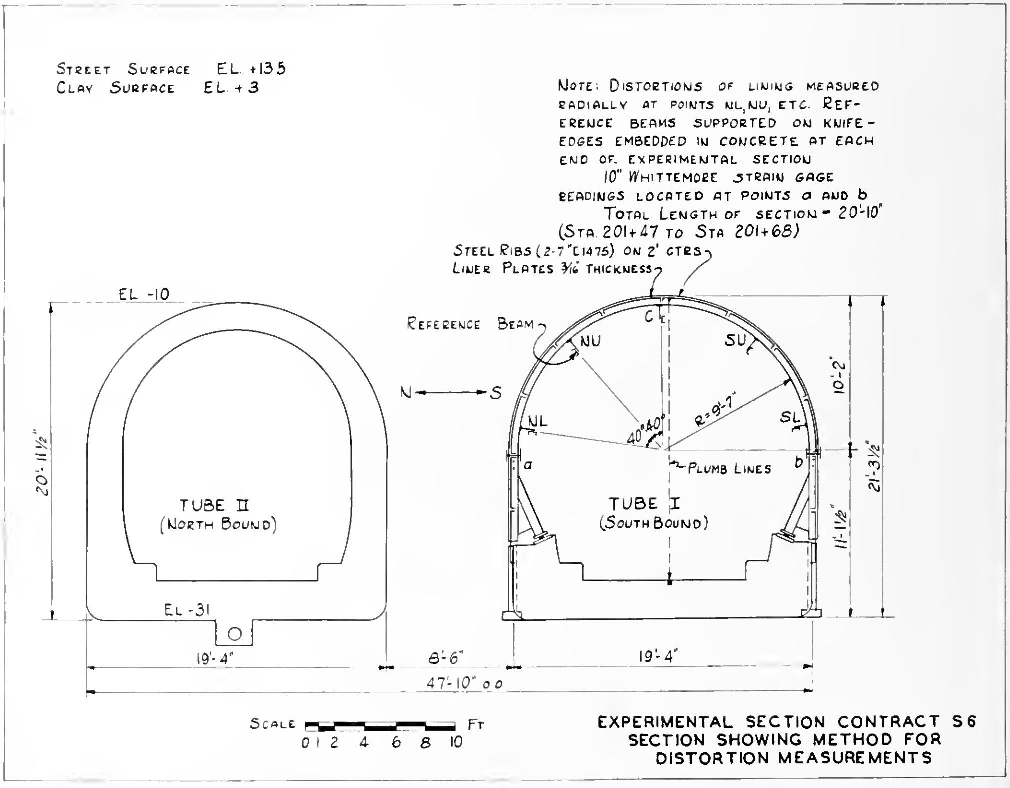
Cross-section through experimental tunnel of horseshoe shape showing construction of flexible steel lining and location of strain and distortion reference points.



INSTITUTE OF GAS TECHNOLOGY

By

HAROLD VAGTBORG

PRODUCTION

Calumet Station: Peoples Gas Light and Coke Co.

The July, 1941, issue of CHEMICAL AND METALLURGICAL ENGINEERING made the following editorial comment:

INVESTING IN THE FUTURE

When asked recently what he considered the best and safest investment in these uncertain times, an eminent statesman said: "Put your money into education, if not for your own sons and daughters, then for your employees and those who are going to carry on the engineering and technology of your business!" We were reminded of that advice by the current announcement of the new Institute of Gas Technology to be established by September, 1941, and administered by the Illinois Institute of Technology in Chicago. Farseeing executives in seventeen of the leading natural and artificial gas companies of the United States are investing at least a million dollars in a ten-year program designed primarily to "train qualified young men, college graduates, for entrance as valuable employees of the gas industries."

Patterned quite closely, it would seem to us, after the highly successful Institute of Paper Chemistry at Appleton, Wis., the new "Gas Institute" will also conduct fundamental and applied research, collect and distribute scientific information pertaining to gas research and development work, at the same time serving as a central organization both to stimulate and co-ordinate the research in the gas industry.

Here, surely, is about the soundest investment any process industry could possibly make. In addition to regular dividends in the form of research results, there will soon be annual stock issues of highly preferred securities in the form of thoroughly trained post-graduates in science and engineering. Their future earning power for the gas industry is almost unlimited.

The foregoing is but one of the many enthusiastic endorsements which have been given the new Institute of Gas Technology by individuals and organizations who believe that through this medium the gas industry will enter a new era of development and public service.

The training of technologists and the stimulating of fundamental and applied research have been problems discussed by gas industry groups for many years. The establishment of the new Institute, the outgrowth of a great deal of careful planning, for an industry that is far flung and that has greatly diversified interests, is intended to concentrate the training of man power and research effort in one institution. It will thus be pos-

sible to bring together the most competent staff and adequate equipment and thereby make available to the industry the highest type of scientifically trained personnel to stimulate and advance scientific knowledge relating to all phases of that industry.

HISTORY

On May 16, 1939, Mr. Frank C. Smith, President of the Houston Natural Gas Company, presented a paper at the meeting of the Executive Conference of the Executive Board and Advisory Council of the American Gas Association. His paper, emphasizing the need of training men and for the prosecution of organized research, both fundamental and applied, was so clear in thought and sound in reasoning that it gave new impetus to the organization of a program to carry out these objectives. A committee was appointed to study the problem and Mr. Smith was asked to serve as its chairman. In due course the report was made to the Executive Board of the American Gas Association and the committee was discharged. The Board decided that the recommended program should be developed, but that it should be undertaken by an organization separate from the American Gas Association, which was not prepared nor organized to undertake the training of gas technologists, nor for fundamental research.

Following this action, the original members of the committee formed what was called the Research Organization Group. The program developed by this group gained support from many interested gas companies who contributed enough money to conduct an investigation as to how to place this enterprise on a practical operating basis.

Frank H. Lerch, Jr., President of Gas Companies, Incorporated, was made Chairman of the Committee on Affiliation of the contemplated Institute with some educational body. Herman Russell, President of the Rochester Gas and Electric Company, was appointed Chairman of the Committee on financial support. The Committee retained Dr. Westbrook Steele, Director of the Institute of Paper Chemistry of Appleton, Wisconsin, to assist in formulating the program.

The Committee headed by Mr. Lerch investigated thoroughly more than ninety educational institutions in the country. This study disclosed that the Illinois Institute of Technology, formerly the Armour Institute of Technology and Lewis Institute, was particularly adapted to the purposes of the proposed Institute and the gas industry, and it was chosen.

On May 23, 1941, the Research Organization Group agreed with the Illinois Institute of Technology to form an Illinois corporation to be known as the Institute of Gas Technology. The incorporators of the Institute are Henry T. Heald, president of the Illinois Institute of Technology; Robert B. Harper, Vice President of the Peoples Gas Light & Coke Company of Chicago; and G. K. Bowden, Attorney.

MANAGEMENT AND OPERATION

Management of the Institute of Gas Technology is vested in a Board of Trustees selected from names designated by the members, the members being those companies who contribute to the Institute. Under the resolution passed by the Board of Trustees, the Institute of Gas Technology has its own management under its own Board. This Board is made up of twenty-two members, five being members of the Board of the Illinois Institute of Technology, of whom one is the President of that Institute. The other members of the Board are seventeen representatives from member companies, which include appliance manufacturing companies. The following men were elected as members of the first Board of Trustees.

Frank H. Adams, President, Surface Combustion Corp.

F. M. Banks, Vice-President, Southern California Gas Co.

Walter C. Beckjord, Vice-President, Columbia Gas & Electric Co.

Henry R. Cook, Jr., Vice-President, Consolidated Gas Electric Light & Power Company of Baltimore.

P. M. Downing, Vice-President, Pacific Gas & Electric Co.

Thomas Drever, President, American Steel Foundries.

E. M. Farnsworth, President, Boston Consolidated Gas Co.

Robert B. Harper, Vice-President, Peoples Gas Light and Coke Co.

George S. Hawley, President, Bridgeport Gas Light Co.

STORAGE

Calumet Station at Night

Henry T. Heald, President, Illinois Institute of Technology.

W. Alton Jones, President, Cities Service Co.

Alfred O. Kauffmann, President, Link-Belt Co.

F. H. Lerch, Jr., President, Gas Companies, Inc.

N. G. McGowen, President, United Gas Pipe Line.

F. B. Owens, Brooklyn Union Gas Company.

Clifford E. Paige, President, Brooklyn Union Gas Company.

Herman Russell, President, Rochester Gas & Electric Corp.

Louis Ruthenburg, President, Servel, Inc.

Frank C. Smith, President, Houston Natural Gas Corp.

Wilfred Sykes, President, Inland Steel Co.

Marcy L. Sperry, President, Washington Gas Light Co.

The first meeting of the Board of Trustees of the Institute of Gas Technology was held in New York on June 19, 1941. The Board approved by-laws, an Affiliation Contract with the Illinois Institute of Technology, and a form of contract to be used between the Institute and its associated members, as well as all the resolutions appropriate to the situation. Officers were elected, President, Henry T. Heald; Chairman of the Board, Frank C. Smith; Secretary, Robert B. Harper; and Treasurer, Raymond Spaeth.

Initial financing for the Institute will provide funds for operating and maintenance expenses in the amount of at least $100,000 a year for a period of ten years. These expenses will include instructional and maintenance costs, but do not include necessary additions to the plant and equipment. This expenditure of more than $1,000,000 is not a part of the $3,000,000 special development program of the Illinois Institute of Technology but directly supplements it.

OBJECTIVES AND PROGRAM

The Institute of Gas Technology has four main objectives,—namely, training of men for the industry, carrying out of fundamental research, collecting and disseminating scientific information, and conducting applied research investigations on specific industrial problems.

The educational program of the Institute will be on a graduate level and will lead to master's and doctorate degrees. It is open primarily to well qualified college graduates who have degrees in chemical engineering from accredited institutions. Graduates in petroleum engineering and a few with unusually sound background in chemistry and related sciences may be considered.

The four-year program includes three years of academic training based on the fundamental sciences and fundamental research. One year of academic work is designed to give the background of the industry and will include operation, management and regulation of public utilities; equipment and material for manufacture, storage and distribution of gas; by-products of the gas industry; management problems of the gas industry; and other related topics.

Supplementing the educational activities there will also be carried on an intensive research program. Members of the faculty of the new Institute are being selected not only on their merits as educators, but also for outstanding ability in research. These men, together with a full-time research staff, and students working on fundamental thesis problems, will make available a great wealth of knowledge relating to gas and its uses. Reviewing what research has brought about in other industries, it seems inevitable that the concentration of effort intended in such a program will produce new information and tools of incalculable benefit.

The Institute will have adequate personnel, shop, and other facilities for the development and trial of ideas resulting from fundamental research investigation. It is planned to provide the new Institute with the foremost library in gas technology in the country. The Institute will collect all scientific publications and available scientific data bearing on the gas industry. It will act as a clearing

DISTRIBUTION

Natural Gas Pipeline
Desplaines, Illinois

UTILIZATION

Calumet Station
Gas Engines

house for all research in the industry. This material together with its own findings will be correlated, published and distributed to member companies in the form of bulletins and reports. Its reference library will be available not only to students and personnel of the Institute, but also to representatives of member companies.

It is hoped that all companies in the industry will be stimulated by the work in the Institute to carry on research activity of their own. If it is found that such activity is beyond the facilities of an individual company, that company or group of companies may take advantage of the facilities of the Institute of Gas Technology under special arrangements available to member companies for special applied research projects.

FACILITIES

Provisions are now completed for adequate housing of the Institute for the first two years in part of a new building at 3300 South Dearborn Street, Chicago. The facilities include class rooms, office units for faculty members, a lecture room, special laboratories for the students, general laboratories for carrying on fundamental research and special laboratories for carrying on applied research on special problems. In addition there are also available the shops and laboratories of Armour Research Foundation and Illinois Institute of Technology.

The utilization of these existing facilities enables the Institute to get under way with its program without delay. However, it is generally believed that the new Institute can be most effective in its services when it exclusively occupies one or more of its own buildings designed for most efficient service. Additions can then be made as the need for this service is demonstrated and supported by the industry.

STUDENT SELECTION AND FELLOWSHIPS

It is planned that the student body of the Institute will eventually number about sixty, fifteen being selected each year from the entire country. For the first year of operation five or six student fellowships will be available. The selection of the students will be on the basis of high scholastic attainment, qualities of personality, leadership, ability, research capacity, moral integrity and social stability. Students of the Institute will be holders of such fellowships, renewable annually until completion of their work.

Each fellowship carries a stipend of $1,000 a year from which $325 is deducted for tuition, leaving the student a monthly income of $75 for the nine months of the academic year. In addition summer employment in the industry for three months at a base pay of $125 per month is virtually assured and is required as a part of the program.

For the current year four fellows have already been appointed and several others are under consideration.

Student contacts thus far have been handled by Dr. Lincoln R. Thiesmeyer, former Associate Professor of Geology at Lawrence College, Appleton, Wisconsin, who is a regular member of the staff, and by Dr. Robert C. Kintner, Associate Professor of Chemical Engineering at Illinois Institute of Technology. The educational program is directed by Dean L. A. Grinter of Illinois Institute of Technology.

It is anticipated that the Institute will have a full-time research staff and teaching staff of specialists in various phases of gas technology and related subjects. The ratio of staff members to student fellows will be unusually high.

PROSPECTS FOR THE FUTURE

For many years the electrical industry has profited from the services of a group of trained electrical engineers. Appliance manufacturers in this industry have grown to be great institutions supporting the technical training of men not only in their own plants, but also through extensive distribution of fellowships in institutions throughout the country.

The establishment of the Institute of Gas Technology demonstrates the confidence of the gas industry that stimulation of research and the training of specialized man power will produce for it men whose scientific stature is comparable to that of Steinmetz, Edison, Langmuir and Westinghouse. The work of such men must inevitably be of incalculable value in the advancement of a civilization based on technology.

THE SUMMER DEFENSE TRAINING PROGRAM

By

JOHN I. YELLOTT

The newest great industry to come to Chicago as a result of the National Defense Program is the building of aircraft engines. When plans were first laid for the construction in Chicago of a great plant to build Pratt & Whitney engines, and of another to make parts for Wright radials, it was evident that the labor situation in Chicago would be a serious one. Early in the spring, a representative of the Buick Aviation Plant called upon President Heald and outlined some of their needs. It was apparent that the operators who will be needed would have to be taken from the local labor market or trained in the school system and in the plants, but, in an enterprise as complex as the manufacture of airplane engines, a large number of highly skilled technical employees are also required. Many individuals will be needed to test the engines after they are built and to inspect the parts as they proceed through the various stages of manufacture. It was difficult to estimate the number of such men who would be needed, since the projected size of the airplane factory was changed almost daily. Estimates indicated, however, that at least 200 engine testers would be needed, as well as approximately 120 who could be classified as Metallurgical Inspectors, about 240 in the field of Production Inspection, and about 20 in the care and operation of Heat Treatment Equipment.

The usual program of the Institute makes no provision for such specialized training as this, but, under the Engineering Defense Training Program, almost anything can be accomplished if it is sufficiently urgent. After studying the situation, the Defense Training Committee came to the conclusion that the job could be done during the summer, if all of the available facilities were employed at both the Lewis Institute of Arts and Sciences and the Armour College of Engineering. Consequently, the Institute took up the challenge and set about the organization of a comprehensive program which would do this job. Five basic courses of instruction were arranged, each offering some seven or eight subjects, and each requiring the student to put in about forty hours per week for ten weeks.

Organization of this program followed the system which earlier Defense Training courses had shown to be necessary. A vice president in charge of each program was given the responsibility of organizing his particular course. To Professor Roesch was delegated the responsibility of handling the airplane engine testing and making proper provisions for

Checking Parts of Cylinder Heads

training of 240 men. Professor Carpenter was given the task of organizing the Metallurgical Inspection Program, and the number of students under his charge mounted to 330. Professor Kozacka, whose years of industrial experience were especially valuable, was assigned the Production Inspection course, and slightly more than 300 students were to be in his charge. Professor Seegrist was delegated to organize a course in Mechanical Design, and more than 100 full-time students were expected to take this. Professor Haga was in charge of the work in Heat Treatment, and he also was in charge of the Metallurgical Inspectors who were stationed at Lewis Institute. Thus the program was organized vertically into five divisions, each of which had at least eight subjects of instruction. It was necessary, therefore, to have a horizontal system of organization with a vice president in charge of each of these subjects. Professor Thompson took charge of the work in Industrial Physics, Professor Winston in Mathematics, Professor Huntly in Materials, and Dr. Budenholzer in Engineering Computations. Mr. C. I. Carlson, Armour, 1919, took charge of the work in Blue Print Reading. The regular faculty members who were in charge of their respective courses also supervised subjects with which they were particularly familiar.

The subjects which were chosen were those for which there was the most obvious need. Each course was especially designed to teach some particular phase of aircraft engine manufacturing or testing, and the instructional material was built specifically around the Pratt & Whitney Model 1830 engine. Actually, so complicated an engine involves problems in almost every field of physics, mathematics, and engineering, and so the selection of instructional material was not difficult.

In order to instruct 1000 students, and keep them busy for forty hours a week, a teaching staff of no small size was required. Fortunately, and necessarily, this program was offered during the summer when the regular activities of the Institute are at their lowest ebb. Consequently, many of the regular members of the faculty were available, and the Defense Program was able to benefit from their experience and ability.

The Defense Training Committee found itself in a series of quandaries as estimates of the possible number of trainees varied from day to day. It was believed at first that most of the trainees would be recent graduates of the technical high schools and it was feared that the lure of this free training would detract from the school's

regular enrollment. Consequently, wide spread publicity was not sought at the outset. When it became evident that too few trainees were in sight, the assistance of Mr. Schreiber's office was solicited, and, through his efforts, the power of the press was unleashed. That the press is indeed powerful is shown by the fact that more than 3000 applicants appeared for personal interviews. Publicity material was prepared, which waved the flag, and in striking red, white, and blue folders announced to the young men of Chicago that an unusual opportunity was on hand. The poster which forms one of the illustrations for this brief report played no small part in arousing interest.

The applicants for the program came from all walks of life, and they ranged in age from seventeen to seventy. They came from near in multitudes and from far in small numbers. From a radius of several hundred miles, eager and enthusiastic applicants came, and demanded the privilege of enrolling in the course. A large staff of interviewers was enlisted, mainly from among the senior cooperative students whose industrial experience fitted them particularly for this task. Each individual who applied was given a personal interview and, after addressing carefully prepared questions to the applicants, the interviewer was able to rate him reasonably well on previous education, mechanical aptitude, and probable employability. The Defense Training Committee carefully scanned all of the applications and from them selected more than 1000 men who seemed best fitted for the courses. The criterion by which selections were made was the contribution which each man appeared to be able to make to the National Defense. Much midnight electricity was burned before the task of selection was done and the effectiveness of the process of selection is demonstrated by the fact that, of the 1091 men who entered the course, 961 completed their work and 951 received certificates indicating that their work had been satisfactory.

In order to handle this number of students, an elaborate office force had to be set up. Sonny Weissman was given the important position of supervisor of students, and, quite properly, found himself referred to most respectfully as "Dean" Weissman. The Defense Training Committee wishes to take this opportunity to thank "Dean" Weissman for his extraordinary efforts in behalf of the program. The fact that the buildings of the Institute remained intact during the summer is due to his restraining influence.

The ping pong room of the Student Union, having survived many violent battles, was stripped of its usual furnishings and was turned into the

Valve Timing

Checking Pistons (Right)

Checking Stub Shafts (Left)

Summer Defense office. Here the numerous office assistants made their headquarters and weekly reports of the progress of the 1000 trainees were inscribed on the records of each man. Reports of absences were turned in daily and also entered on each man's record so that at any time, any individual could be located and his progress from the beginning of the course could be determined at a moment's notice. Photographs were taken of each student, one of which was attached to the certificate which he received at the end of the course and the other attached to his application form. This feature, a new one in the Defense Training Program, was considered desirable in order that there might be no interchanging of records or credentials, a matter which might be extremely serious in a defense industry.

The course began operations on June 23, and so carefully had preparations been made that most of the students and most of the instructors came together in the proper rooms at the proper times. Approximately 200 of the students were at Lewis Institute and the remaining 870 made their way daily to the Armour campus. The question of leisure time had concerned the Defense Training Committee somewhat, but it proved to be no problem. The students found that there wasn't any leisure. The program went with remarkable smoothness and, after the few preliminary difficulties were smoothed out, these 1000 trainees went about their business with the assurance of a college senior. This should occasion no surprise since many of them were college graduates, but in fields unrelated to airplane manufacturing.

The incidents of this hot and busy summer are far too many to mention. Outstanding among them are the baseball games in which the administration staff, led by "Dean" Weissman, proved their superiority over all others. A number of unusual educational devices were employed. Most noteworthy was the utilization of an actual test-cell set-up, by which the engine testers were able to get experience in the manipulation of the engine-testing equipment. Of course, a 1200-horsepower airplane could not be operated, because no brake was available which could absorb its power. Instead, the instrument board of the test cell was set up in the new Research Building, and all of the test connections were made to a Pratt & Whitney engine which was mounted just as it will be in the plant. The fact that the engine had no pistons or cranks did not detract from the realism of the situation. The features of this test set-up could therefore be explained to each of the students, and, when they actually begin operating these great engines, they will be thoroughly familiar with the testing equipment. In common with the other devices of the plant, the testing will be done on a mass-production basis with oil, gasoline, and electrical connections being made by plug-in devices rather than by individual plumbing, pipe-fitting, and wiring for each new engine. The testers made several trips to the Pullman Free School of Manual Training where they were able to get actual experience in running large air-cooled engines. This was a valuable part of the program, and the Defense Training Committee expresses its appreciation to the Pullman School for this courtesy.

Production Inspection is not usually included in the curriculum of an engineering course, and accordingly new laboratories had to be set up for this purpose. When a search was made for equipment for this laboratory, a cry arose that such things as micrometers were unattainable. A little investigation in the hardware stores soon revealed that a large supply of excellent equipment was still available. Consequently, the Institute has acquired a supply of micrometers, gages, comparators, etc. The Inspection Laboratory was organized by Professor Kozacka and much of the material to be inspected was made in the shops at Lewis and Armour. Requests for airplane engine parts were made, and they bounced back and forth through government agencies all the way up to the O.P.M. Nothing was available, since any engine which had prospects of being able to run had already been shipped to England. Fortunately one of the instructors was able to locate a source of radial engine parts through a commercial airline, and the inspectors were, therefore, able to inspect such

things as discarded crank cases, pistons, and other battle-scarred parts.

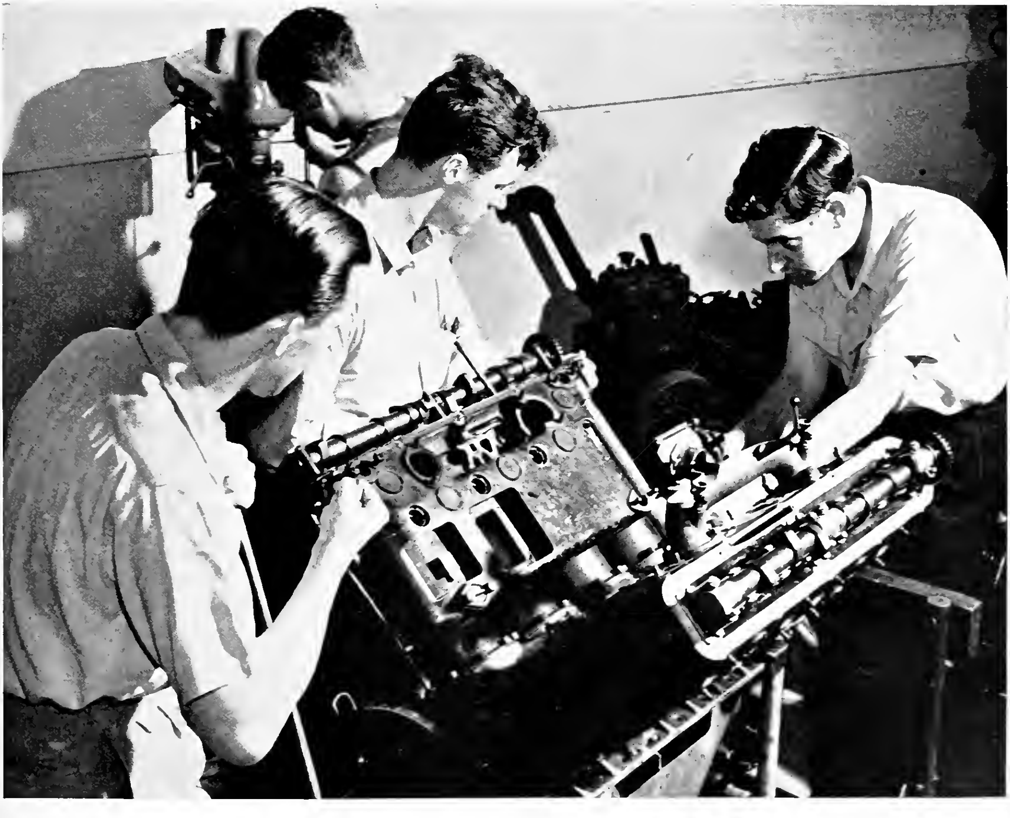
The work in Heat Treatment and Pyrometry also called for equipment which was not previously available, and, as a result of telephone calls to Philadelphia, a good supply of excellent pyrometers was obtained. Future students at the Institute, in both regular and Defense courses, will profit greatly from these excellent pieces of apparatus.

The Program operated with unexpected simplicity. The students were so busy that they had very little time to get into mischief, and poor morale, which had been feared, did not develop. During the last week of the course a mass meeting was held at which the students were addressed by "Dean" Weissman, by President Heald, and by Colonel Armstrong of the Chicago Ordnance District.

The purpose of the course, as pointed out in all of the publicity material, was to provide training for prospective employees in the airplane engineering plant. It is most gratifying to report that of the 951 who finished the course and received certificates, more than 600 have been offered jobs by the Buick Company and the remaining students are rapidly finding jobs in private industry. The Defense Training Committee feels that the completion of this training program is a real contribution to the National Defense, and the Committee wishes hereby to express its appreciation to all those whose unremitting efforts through the hot days of the summer made possible the success of the program.

As this brief report is concluded, the final report for the Engineering Defense Training Program has been received from the U. S. Office of Education in Washington. It is interesting to note that Illinois Institute of Technology was authorized to train 4,539 individuals out of a total number throughout the country of 106,629. In the entire country, the only institution to exceed the Institute in number of trainees was Pennsylvania State College, which, through the use of its extension division, trained a total of 14,067 E. D. T. students. The total amount of money which has been paid to the Illinois Institute of Technology for training under the Engineering Defense Training Program was $248,494.00, whereas the total amount for the entire country was $7,245,893.00. Thus the Institute has done 4.27 per cent of the total training, with an expenditure of 3.43 per cent of the total. Since our program included almost 1000 full-time students, we feel that a very creditable economy has been achieved. Since these funds will eventually come from our own pockets, this policy of enlightened self-interest will be continued.

Magneto Timing



PROFESSOR PAUL RETIRES

Professor Charles E. Paul, Chairman of the Department of Mechanics of Illinois Institute of Technology, and Director of the Science Curricula of Armour College of Engineering, retired from active duty at the end of the academic year 1940-1941, at his own request. During his long service at Armour he has been one of the most active members of the faculty. At one time he had the exceptional responsibility of serving as chairman of three departments simultaneously.

Professor Paul came to Armour Institute of Technology in 1908 as Associate Professor of Mechanics. Born in Belfast, Maine in 1876, he attended Belfast secondary schools before going to Chauncy Hall preparatory school in Boston. He received his undergraduate training at Massachusetts Institute of Technology where he had conferred upon him the degree of S.B. in mechanical engineering.

His professional and educational experience has been unusually wide. In 1903 he joined the staff of Kansas State College; in 1905 he served as a department head on the staff of New Mexico State College; and from 1907 until 1908, when he joined the staff of Armour Institute of Technology, he was on the faculty of Pennsylvania State College as Professor of Mechanics.

Throughout his career as a particularly well-liked teacher he was engaged continually in professional consulting work. Before entering upon his teaching career, he served two years (1900-02) as a designer and sales engineer for the James W. Tufts Company of Boston. As a consultant, he specialized in industrial construction and building materials.

From 1915 to 1921 he was construction engineer for the National Lumber Manufacturers' Association and in this connection he did a large amount of research leading to the present American Lumber Standards. He compiled the original tables for basic lumber standards which are contained in that important publication. Among his other prominent professional engineering positions was that of consulting engineer for the Weyerhaeuser Timber Company, St. Paul, Minn., 1920-30.

From 1910 to 1915 he was Associate Editor of *The American Builder* and *The Cement World,* both of which have since merged with other publications having new names. He is also author of many books, pamphlets and technical articles relating to building construction, concrete, lumber, estimating, and contracting. At one time he wrote a series of sixty consecutive articles on building construction and materials for one of the leading construction magazines. He has also written the larger part of three volumes of an encyclopedia of building construction, as well as a handbook of estimating and contracting.

He is a member of the American Society for Testing Materials, having served as chairman of the sub-committee on timber specifications for many years; the National Fire Protection Association, serving on the committee on building construction; the Society for the Promotion of Engineering Education; the Western Society of Engineers; Tau Beta Pi, national honorary engineering fraternity; Theta Xi, national social fraternity; and Sphinx, literary fraternity.

NEW PUBLICATION

During the past summer a new publication has made its appearance on the campus. *Research Publications* of Illinois Institute of Technology will be issued regularly as groups of reprints selected from papers published by the teaching and research staff. Each number will contain papers in a single broad field of investigation. It is not intended that all publications of the faculty shall

(Turn to page 49)

Hedrich Blessing Studio

JOHN H. COLLIER NEW TRUSTEE

John H. Collier, President of Crane Co., was elected to membership of the Board of Trustees July 21, 1941.

Mr. Collier was born in Chicago, Illinois; attended the public grade schools of Chicago; graduated from the old English High and Manual Training School; and attended Purdue University for two years, leaving there to take a job with Crane Co. in their foundry. He worked for seven years in the shops at the molding and machinists trades, graduated into the Machine Design Department, and then through a succession of foremanships to the superintendency of the Brass Foundry.

In 1917 Mr. Collier was appointed General Manager of Crane Co.'s Eastern Plant at Bridgeport, Conn., and in 1929 was sent abroad in charge of the Company's foreign plants and operations as President of the French subsidiary company, and Chairman of the Board of the English subsidiary. He returned to Chicago in 1933 as Vice President in Charge of Manufacture; became a Director of the Company in 1935, and was elected President in May, 1941.

Mr. Collier's residence is in Chicago and his summer home in Fairfield, Conn. He is a member of the Chicago Club, University Club of Chicago, The Union League, and The Tavern Club of Chicago, The University Club of Bridgeport, Conn. and The Fairfield Beach and Country Club.

THE NEW CURRICULUM IN AERONAUTICAL ENGINEERING

By

PHIL C. HUNTLY

Aeronautics is not a new subject at Armour College of Engineering of Illinois Institute of Technology. For many years, courses in several branches of the subject have been offered.

Professor M. B. Wells (retired), who was an ardent follower of air travel before there was an airplane, was the prime mover in introducing this work at Armour. Professor Wells' studies date back to his reading of John Wise's *Through the Air* and Flammarion's *The Atmosphere;* after reading these several times he was thoroughly sold on the idea of travel by air. Later he made studies of the reports and work done by Langley and Chanute, followed by that of the Wrights and their successors, Glenn Curtiss, Brookins, and others. Watching these men fly, and seeing the mechanics of that time build and repair the ships, Wells and others wondered just what stresses were developed, and if the members were strong enough to withstand the forces to which the structures were subjected.

Library research was started at this time by Professor Wells. More than a year was spent in collecting data from the Armour and the Crerar Libraries. All material that had a bearing on the objective was studied and catalogued for future use. During this study period close contact was kept with builders, pilots, and mechanics to obtain as much information as possible relative to existing ships, their dimensions, sizes and weights of parts. Taking all the available data into consideration, the stresses in members were calculated, making assumptions for all forces not known. (Turn to page 50)

THE FALL ENGINEERING CONFERENCE

The first Fall Engineering Conference of Illinois Institute of Technology will be held Thursday and Friday, October 30 and 31, at the Palmer House. The subject will be AIRPORTS. Morning and afternoon sessions will be held Thursday, with a luncheon and address intervening. Thursday evening there will be an informal smoker. Following the morning session Friday will be a luncheon, and an inspection trip by bus to the Municipal Airport.

As we go to press, the program is practically complete, but some additions and minor changes are possible. Our correspondence with the air lines, with engineers, and with various organizations indicates great interest in the project.

The tentative program is as follows:

Grading, Drainage, and Paving—William A. Aldous, Civil Aeronautics Administration.

Airport Lighting and Airport Traffic Control—H. J. C. Pearson, Civil Aeronautics Administration.

Capacity and Operating Problems—A. F. Bonnalie, United Air Lines.

Fire Hazard and Fire Protection—F. B. Quackenboss, Rollins Burdick Hunter Co.

Airport Management — John Groves, Washington National Airport.

Plane Servicing Arrangements—(To be assigned).

Economic Factors of the Lack of Instrumental Landing Systems—A. E. Blomquist, Eastern Air Lines.

The Washington National Airport—H. L. Cheney, Architect.

Control Tower Operation — John Becker, Chicago Municipal Airport.

Co-ordination in Airport Design — L. L. Odell, Pan American Airways—Consultant.

Lighting of the Chicago Municipal Airport—Harry Baumer, Chicago Municipal Airport.

At the smoker to be held Thursday evening there will be an informal discussion on Early Days of Aviation, led by M. B. Wells, Professor Emeritus at Illinois Institute of Technology, a pioneer in the study and teaching of aeronautics. We are informed that several veteran aviators will take part.

Graduates of the Institute, and others who are interested, are cordially invited to attend the three sessions, the two luncheons, the smoker, and the inspection trip.

Arrangements are in charge of J. B. Finnegan, C. O. Harris, and S. M. Spears, Illinois Institute of Technology.

THE NEW CURRICULUM IN INDUSTRIAL ENGINEERING

By

HENRY P. DUTTON

This fall the sophomore courses in the new curriculum in Industrial Engineering will be offered at Armour College, in both day and evening classes. Other courses will be added as called for by the schedule until the curriculum is in full operation.

In the new curriculum the term "industrial engineer" is taken in a somewhat literal sense; its graduates will have had as much or more of basic mathematics, science and mechanics as the graduates of other engineering curricula, and will have carried out a substantial sequence of machine design courses, requiring the application of theory to engineering problems. Together with the usual survey courses in thermodynamics, electricity and other subjects, these courses will constitute roughly three-fourths of the curriculum; the man who completes them will think as an engineer, and will be at home with technical and mechanical situations.

For many years a large part of the graduates of engineering colleges have eventually found themselves in work which, while it has an engineering background, deals primarily with the management of men and capital. The engineering discipline, regardless of curriculum, has proven itself a good preparation for business; its graduates are increasingly recognized as good material for development as supervisors, salesmen and administrators. The new curriculum will, it is hoped, give its graduates the same solid foundation in mathematical thinking and experimental science, will give needed attention to the problems of dealing with men, in which many engineers are deficient, and will teach systematically the technique of production, which is so often learned catch-as-catch-can by the engineer on the job, with varying success.

At the turn of the century, production management was rudimentary; today it is a highly developed art based more and more on precise measurement and analysis. A generation ago, accounting was a system of records, kept by men untrained in even relatively simple mathematical analysis, isolation of variables, or projection of trends. Today, the use of accounting in business control draws heavily on economic and mathematical theory. So also, inspection, once a matter of rough and ready judgment or a go, no-go gauge, today makes extensive application of the mathematical theory of probabilities. Market analysis will occur as another example. In short, in field after field, management is supplementing trading sense and the instinct for getting along with people, by the analytical methods of the economist and the engineer. It is this development of managerial technique which makes logical a course designed to embrace it; Illinois Institute is the twentieth engineering college in the country to offer such a program.

How does a course in Industrial Engineering differ from a commerce course in Industrial Management? The answer is that in the commerce course a greater amount of time is devoted to descriptive and procedural courses, such as advertising, corporation finance, retailing, banking and the like. On the other hand, there is no comparison between the thoroughness of the mathematical preparation in the engineering course and that of the average commerce course. It is believed that because of this thoroughness the engineering course provides a better discipline for those fields in which the requirements are analytical rather than procedural. Further, 145 hours of credit are required for graduation in Industrial Engineering, as against 120 hours in the usual commerce course.

The introduction of so much work in mathematics and science means that the usual commerce subjects must be compressed. The direction of compression is toward the elimination of much procedural and descriptive material and a concentration on the application of principles and methods of analysis.

There has already been an active interest on the part of students in the new course. Every business which employs technical engineers needs also managers, supervisors, methods men, accountants, salesmen, buyers and personnel men. There are also many openings in industries which are not usually thought of as fields for engineers—retailing, financial institutions and holding companies, insurance companies and banks, to name only a few. Nor should we forget the steadily growing demand for trained men in the government services, local, state and national.

A recent book, *The Managerial Revolution,* reviewed in another column of this issue, points to the increasing role played by the professional manager and administrator in the complex and highly organized communities of today. Certain it is that whether industrial and economic leadership is exerted through the gov-

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THE BOOK SHELF

Language in Action, by S. I. Hayakawa. Harcourt, Brace and Co., 1941. Book-of-the-Month Club selection for December, 1941.

Words and those permutations and combinations of words which become, at their most complex level, systems of philosophy, theology, and politics have always exercised a magical influence over man. Once given a method of systematizing his grunts and groans, man tends to translate his actions and perceptions into words. So primitive man put into words the charms by which he exorcised devils, propitiated spirits, and averted impending evil. So modern man puts into words the magic ties that bind him to a particular woman, to a particular plot of ground, or to a particular flag. Vocal symbols are used to represent certain segments of reality, and over these symbols men fight and kill and die.

If the symbolic nature of this linguistic habit is ignored, words and word-complexes become confused with the things they symbolize. There may be no discernible relation between a word-complex and the reality that it is intended to represent, yet, historically, men's lives have been ruled, guided, and determined by the word-complexes that they bear about in their brain cells. As the medicine-man, the tribal chief, the priest, the advertiser, and the demagogue well know, man is more effectively ruled by symbols than by the whip, the lash and the dungeon. Because the operation of this government of words lies so closely round us, it has, until quite recently, escaped general notice. Only with the advent of large-scale advertising and world-wide propaganda has there developed a popular interest in the use of verbal symbols as a means of invisible government. Since this hidden government rules not only every act but even each thought of our lives, it has become imperative in the modern world to investigate the nature of verbal symbols and to reach some understanding of the magic of words. The formal pursuit of this investigation is known as semantics.

Semantics, the study of the relation between word-complexes which men construct and the phenomenal world which men seek to understand and control, is still in its infancy. However important the contributions made by Plato, by the Alexandrian analogists and anomalists, by medieval philosophers, and by Hume, it is principally from Bréal's *Essai de Sémantique* (1897) that semantics takes its origin as a separate field of learning. In recent years it has become both a science and a philosophy. As a science it seeks to examine and classify verbal meanings and to establish thereby certain principles of signification. Hence the suggestive title used by Ogden and Richards, *The Meaning of Meaning*. As a philosophy it seeks to define the relation between meaning and reality. Obviously such an approach to verbal constructs is exceedingly complex, extending as it does into psychology, anthropology, and related fields. Because of this complexity and because of the relative modernity of the science, the basic works in the field are incomprehensible except to scholars, while the popular works have hitherto failed to do more than restate the obvious in a strange and curious jargon of terminology. As a result popular knowledge of semantics has been limited to a few random inquiries into the nature of "propaganda." Popular interest was excited, but there was no satisfactory study to satisfy that interest.

The lack has now been remedied. In his *Language in Action* Professor Hayakawa succeeds in presenting the basic principles of semantics in an intelligible, informative, and highly interesting way. With a minimum of technical vocabulary, the book attacks various problems of verbal significance and provides the reader with a framework for further investigation. The intelligibility of the study has already been tested by three years of classroom use at I.I.T. Its essential accuracy has been attested by scholars in the field. And the choice of *Language in Action* by the Book-of-the-Month Club for December, 1941, sufficiently indicates the excellence of its manner of presentation. All in all, Professor Hayakawa has successfully summed up the studies of previous scholars and, by means of well-chosen illustrations and pointed examples, provided an introduction to semantics which deserves to be widely read. It should appeal to the general public as readily as it has to students. And for much the same reasons.

For *Language in Action* is more than an introduction to problems of meaning. Professor Hayakawa suggests that word-complexes should bear to reality the same relation that maps do to territories. If a map misrepresents a particular terrain, he who uses it is likely to be lost. And if a word-complex, whether it be a religion, a philosophy, or a politic represents reality inaccurately, he who is ruled by it becomes psychologically lost and confused. The conscious analysis of verbal constructs tends to liberate man from that hidden government of words which operates through so many channels of modern life. An examination of the source of that government, of the laws of its realm, and of the results of its decrees enables man to understand, and thus be in a position to control, that hidden government. Professor Hayakawa's application of semantic principles to various phases of modern life, though undertaken only for purposes of illustration, vividly suggests the value of this book for the intelligent reader.

F. R. White.

The Managerial Revolution, by James Burnham. The John Day Company, New York, 1941.

According to the author, within two years—or two decades at the latest—the system of privately owned and controlled capitalism, which has evolved since the sixteenth century, will have been displaced by a new system and dominated by a new class—*the managers*. This process is already far advanced, not only in Russia and Nazi-dominated Europe, but also in the United States. It makes little difference, says Burnham, who has the certificates of ownership in his safe deposit box. The important thing is who is directing the policies of the concern. (At this point he is more

(Turn to page 50)

Imagine! "Tightwad" Thompson saying:

"Waiter Bring Me 33 FINE BREWS!"

Enjoy it in full or club size bottles, handy cans, and on draft at better places everywhere.

...with a Blue Ribbon on it

IT'S "33 TO 1"... OUR FRIEND THOMPSON "TREATED US RIGHT" WHEN HE INTRODUCED US TO **PABST BLUE RIBBON!** LIKE THE FINEST COFFEE AND CHAMPAGNE... *EXPERT BLENDING* MAKES IT *SMOOTHER... TASTIER... UNIFORMLY DELICIOUS!*

"Next time, why don't *you* treat yourself to PABST BLUE RIBBON? . . . Remember, '33 TO 1' BLENDING makes it your *best bet in beer!*"

33 FINE BREWS BLENDED TO MAKE ONE GREAT BEER!

. . . IT'S SMOOTHER . . . IT'S TASTIER . . . IT NEVER VARIES

OBITUARY

GEORGE NOBLE CARMAN

Chicago, June 27, 1895.
Mr. George N. Carman,
Chicago.
My Dear Sir:

At a meeting of the Board of Trustees of the Estate of Allan C. Lewis held this afternoon, it was resolved to tender you the position of Director of the new Lewis Institute commencing September 1st next.

Please notify if this will be accepted by you.

Yours truly,
JOHN McLAREN, *Sec.*

And from this September 1 until his retirement forty years later to the day, it is impossible to separate the man, Carman, from the school he established. He was Lewis Institute. The work he did there, from a purely experimental angle, is too well known to need elaboration. It is sufficient to say that when he retired, nearly one hundred thousand students had attended the Institute from one quarter to twenty years (in the case of one evening student) and with few exceptions, had found there what they sought.

Mr. Carman was a comparatively young man when he was offered this position of Director, but he had had a wide experience in the field of education. Born in Walworth, N. Y., in 1856, he came to Michigan and entered the University in 1875. Two years later arrangements were made whereby, while he was teaching he could study alone, reporting to his instructors at given periods. When he graduated in 1881, he was principal of the Ypsilanti High School. Later he became in turn, superintendent of schools in Union City, principal of a school in Brooklyn, of a high school in St. Paul, associate professor of English in the University of Chicago, and dean of Morgan Park Academy.

While at Morgan Park Mr. Carman was one of a committee of five men who originated the idea and organized the North Central Association of Colleges and Secondary Schools. He acted as its secretary for several years, was treasurer, and later president of the Association. Through the years his advice was widely sought by educators, and he gave much time to matters of public education in the city of Chicago. In recognition of his contributions to education, in 1906 the University of Michigan granted Mr. Carman the degree of Master of Arts.

After the death of his wife—he had married Miss Ada J. MacVicar of Toronto in 1883—Mr. Carman gave more and more of his time to personnel work with the Lewis students. Probably no other single educator has ever accomplished more in this line of work. The regard in which he is held by thousands of students is perhaps best expressed in a theme written by one of them:

"He is not a young boy, but an old man upon whose slightly bent back rests the responsibility of young men and women. He has a very fine looking face, a practically bald head, and the warmest, kindest, and most friendly smile I have ever seen. He has the keenest appreciation and understanding of the trials and tribulations of young people, and is forever ready and willing to help them out of any difficulties they may have. He has a very fine sense of humor together with a most keen mind. His business has brought him into personal contact with thousands of different people. However, he rarely forgets a face. He may not immediately connect the name with the face, but generally he remembers the person.

I had a serious problem, and he put me on the road to solving it. If I do not do so now, I shall have only myself to blame. I shall never be able to repay him fully. I call this particular man a friend. He has done more for me than anyone outside my family; so I regard him as my greatest friend, and when he leaves us I shall feel that I have suffered a definite loss."

With Mr. Carman's death on June 24, 1941, these same thoughts will echo in the minds of the great body of Lewis alumni.

AGNESS J. KAUFMAN.

MRS. BARBARA ALLISON

Mrs. Barbara Allison, a former Chicagoan and the mother of G. S. Allison, treasurer of the Illinois Institute of Technology, died July 11, 1941, in the home of a daughter, Mrs. J. F. Ramier, in Memphis, Tenn. Mrs. Allison was 79 years old. She came to Chicago with her parents in 1870 from the Shetland Islands, where she was born. She spent most of her life in Chicago but in recent years had lived with Mrs. Ramier. She leaves another son, R. W. Allison, and another daughter, Mrs. W. B. McCreary.

BETTER MOUSETRAPS

One of the most promising of new research tools for the study of certain properties of materials of construction and protective coatings is the magneto-striction oscillator. Utilizing the principle of longitudinal vibration of a metal tube in resonance with an electrical control circuit, this instrument can subject test samples to terrific punishment. In a matter of minutes a specimen of smoothly polished steel can be reduced to a rough pockmarked mass simply by vibrating in a glass of water. The apparatus has one serious drawback, however. Its high pitched note is so intense that it can cause actual pain to the listener.

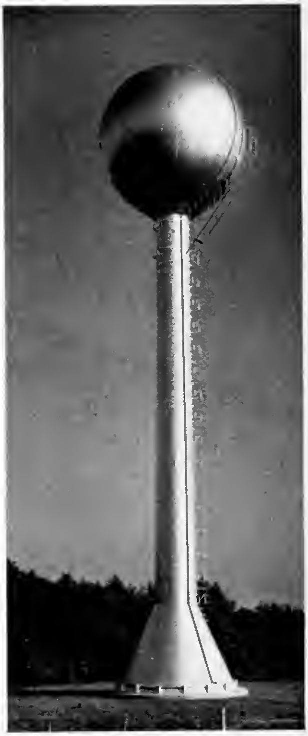
Such was the problem faced by the Research Foundation sound engineers when the Foundation designed, built and placed in operation its newest oscillator. The machine itself could not be quieted because a reduction in amplitude would mean a corresponding loss of effectiveness. Instead, they built a special housing for the vibrating head with exterior connections for electrical leads and cooling fluid. When completed, the housing absorbed 99.999 per cent of the sound energy emitted and research workers were able to carry on their activities without the distracting discomfort previously experienced.

Coordinated closely with other developmental projects the sound engineering laboratories of the Armour Research Foundation have been able to render a very substantial service to industry and the public welfare. Under the leadership of Dr. H. A. Leedy, well known for his scientific work and publications in this field, numerous investigations have resulted in the removal of unnecessary noise and dangerous vibration from buildings, industrial machinery and devices and structures of all kinds.

The Research Foundation uses two types of instruments in evaluating sounds and vibrations. In or about the ordinary audible range, the sound-level meter or "decibel-meter" is employed. This is often augmented by a wide-range vibration meter. The broader range of vibrations are frequently handled with the seismograph, commonly known for its use in recording earthquakes. Both instruments with their accessories are capable of making automatic permanent records. Another interesting and necessary adjunct to the facilities for noise studies is the soundproof room. Located in the main Research Foundation building, this 10x11x9 room with its six-inch walls is an isolated solid structure completely floating on cork. In spite of the surrounding city and laboratory noises, the interior of this room is as quiet as a deserted country road at night. Here, accurate measurements can be made without interference from external sounds.

The diversity of the applications of sound and vibration engineering to research problems handled by the Foundation is not surprising. Studies of the behavior of giant drop-forge hammers have yielded information on plant design and location. Acoustical investigations in theaters and other city buildings have been made in connection with the construction of the new Chicago Subway. The quieting of water noises in pipes, valves and other plumbing fittings is going forward with a view to reducing mechanical sounds in the American home. As a result of studies and improvements by Dr. Leedy, one of the best known office calculating machines now emits only twenty-five percent of its former noise energy. Further pleasures are in store for the office worker in the newest laboratory model of this machine, in which more than half of the remaining noise has been removed. Sound measurements are being made upon the Chicago motor coaches with a view to determining operating noises and means for their reduction.

Working with the Noise Reduction Council of Greater Chicago, the Research Foundation is making extensive surveys of the sources of the principal city noises. Using a "motorized unit" consisting of a Foundation service-car fitted with complete sound measuring and recording apparatus, studies are being made at various intersections and other locations throughout Chicago and the records are being analyzed in the laboratory. From observation of the portion of this work now completed, it is already evident that much of the clamor and turmoil of the metropolis can be summarily eliminated.



NOVEL WATER TANK GAINS POPULARITY

During the last two or three years the popularity of Watersphere design tanks for providing gravity pressure in water systems has spread rapidly. While most of them are located in the midwestern states of Illinois, Wisconsin, Indiana, Minnesota and Colorado, recent installations have also been made in Ohio, Arkansas and Texas. The one illustrated above, installed by the Chicago Bridge & Iron Company at Coloma, Wis., has a capacity of 40,000 gals.

HELP!

HELP!

HELP!

The year 1940-1941, September 1, 1940, to August 31, 1941, has been the most successful year the Placement Department has had since its official inception in September, 1938. This success is indicated by the following facts:

(a) The largest number of placements in the history of the college. Total registered placements 801.

(b) The highest initial average monthly salary obtained in the history of a graduating class. Average, $139.00.

(c) The largest number of industrial firms, seeking employees, visiting the Placement Office in the history of the college. Total number of firms interviewing on the campus, 156. This does not include the enormous number of requests for men by mail, telegram, telephone, and governmental agencies.

(d) The largest number of alumni placements in the history of the college. The positions involved great responsibility and, in many instances, greatly increased salaries. Frequently an employed alumnus, dissatisfied with his status, registered here as desiring a change, and when offered a better job through the services of this office, the new offer brought from his present employer a more definite outline of his future in his company, an increase in salary, and, in some instances, a bonus to remain where he was. (Let it be said here that it is not the policy of this office to solicit alumni to leave their jobs for new ones. The alumni who are dissatisfied with their progress, who are looking for more money or increased responsibility, must register in this office as desiring to have their names on our active list. We do not tamper with working alumni, unless specifically requested by the alumnus himself. This policy is strictly adhered to as we wish to protect our good friends who hire our men from year to year.)

(e) A larger number of summer, part-time and holiday jobs during the school year than ever before in the history of the college. These jobs numbered about 300.

The problem of determining which of a number of offers they should accept. In conjunction with senior and graduate placement we were busy in the placement office placing alumni, Evening Division students, Engineering Defense Training students, students who wished part-time jobs, and alumni seeking change of position. In addition, preparatory work had to be done to find openings for students who wished summer employment. There were hundreds of letters to be written; the incoming and outgoing telephone calls reached a maximum of 3500 in one month; messenger boys delivered and took away telegrams having to do with arranging inter-

PLACEMENT OF THE CLASS OF 1941

Departments	Number Graduated	Number Employed	Per Cent Employed	Aver. Initial Monthly Salary
Architectural	12	12	100	$142.78
Chemical Eng'g	41	40	98	139.93
Civil Eng'g	25	25	100	136.92
Electrical Eng'g	37	37	100	137.47
Eng'g Science	2	2	100	130.00
Fire Protec. Eng'g	13	13	100	135.00
Mechanical Eng'g	61	61	100	142.68
Totals	191	190	99.5	$139.90

Percentage of 1941 Class placed 99.5
Average initial salary for Class of 1941 .... $139.90

The one unemployed graduate received an offer for a position with the Government, but inasmuch as he would be located out of town, he did not accept.

Master's Degrees conferred 25
Graduate students registered with this office 17
Graduate students placed by this office 16
Average initial salary of graduate students placed by this office $156.77

The placing of our seniors involved work that extended over a period of six and a half months. It was not unusual for a senior from this year's class to have to decide which of five or six good offers he would accept. The graduate students were as much in demand as the undergraduates and they too were frequently faced with

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FROM YEAR TO YEAR

A RECORD OF ARMOUR ALUMNI AROUND THE WORLD

By

A. H. JENS, '31

ALUMNI BANQUET

At the Knickerbocker Hotel in Chicago, on an early summer evening, the alumni of Armour Institute of Technology held the annual banquet of their association. The assembled group, numbering more than 325, were treated to an unusual program that included a radio presentation of President Roosevelt's unlimited emergency fireside speech. Developments at Illinois Institute of Technology and the progress made by the alumni association in the year that had passed were presented in full detail. The date was May 27, 1941.

Awards of the year, numbering four, were presented to individuals who had performed in an outstanding manner either for the association, the Institute, or in their profession. First to be honored was Roy M. Henderson, E.E., '02, who received the coveted Armour Alumni Service Award Key. This award has been made to:

John J. Schommer, Ch.E., '12
Harold W. Munday, C.E., '23
Charles W. Hills, Jr., E.E., '11
David P. Moreton, E.E., '03
Louis J. Byrne, M.E., '04.

Two men, William Fargo Sims, E.E., '97, and Robert I. Wishnick, Ch.E., '14, were honored with the Distinguished Service Award because of their accomplishments respectively as electrical engineer and chemical engineer. Previous recipients of the Distinguished Service Award are:

Francis G. Pease, E.E., '01, for outstanding work in the field of astronomy.

Howard I. Krum, E.E., '06, for outstanding work in developing the Teletype.

Alfred S. Alschuler, Arch., '99, for outstanding work in architectural design.

Clarence W. Muehlberger, Ch.E., '20, for outstanding work in the field of toxicology.

Robert B. Harper, Ch.E. '05, for outstanding work in the field of gas engineering.

John J. Schommer, Ch.E., '12, for outstanding work as an administrator.

C. D. McAleer, Jr., a member of the class of 1941, was presented with the Award of Merit because of his record not only as a student but also because of his participation in school activities.

Considerable interest was expressed in the efforts of the board of managers in attempting to bring about the formation of an alumni association that would include alumni of Armour, Lewis and Illinois Institute of Technology. A resolution prepared by a special committee of the board of managers to the effect that an alumni

McCaffrey: Heald: Sims: Knuepfer

WISHNICK

HENDERSON

McALEER

association be formed including each of these groups was presented by alumni president J. Warren McCaffrey, Ch.E., '22. The resolution as read was approved and was referred back to the board of managers for further study.

Feature speaker of the evening was Nathaniel C. Leverone, president of the Canteen Supply Company, who was introduced by former alumni president John Schommer. For thirty minutes Mr. Leverone presented a series of anecdotes and incidents that held his audience enthralled. Following a short recess to permit the broadcast of President Roosevelt's speech came the introduction of individuals sitting at the speakers table.

Institute Trustee Raymond J. Koch presented an outline of the present building program at Thirty-third and Federal Streets. A model of the contemplated Technology Center was on display in front of the speakers platform and was used by Mr. Koch in illustrating several points in the construction program.

President Henry T. Heald followed, and his statement was confined to the educational program at the Institute, especially the intensified National Defense instruction that was part of the summer program. After presentation of awards a brief report of alumni association finances was made by Secretary-Treasurer William N. Setterberg, Arch. '29.

As a usual feature of the alumni banquets the combined Institute Glee Club and Orchestra gave several musical selections under the capable direction of O. Gordon Erickson. Arrangements were under the direction of Chairman Eugene Voita, Arch., '25, who was assisted by a staff of lieutenants.

1931 REUNION

Celebrating the tenth anniversary of their graduation from Armour Institute, the Class of 1931 prepared a comprehensive program that culminated with the annual alumni banquet on May 27, 1941. Activities included a golf tournament at Lincolnshire Country Club, baseball game at Cubs Park, reception and dinner at the Chicago Engineers' Club, luncheon at the Columbia Yacht Club, visit to the Institute, and a reception in the Red Room of the Knickerbocker Hotel preceding the banquet.

On Saturday, May 24, the Lincolnshire Country Club was the scene of an intensely fought golf tournament between two teams composed of seven architects and seven engineers. The architects, captained by Elmer Holin, defeated the engineers, captained by Art Jens by a 736-754 score. Architects' scores were: Wally Miles, 117; Ray Shoan, 103; Oswald Cook, 103; Al Mell, 107; Elmer Holin, 93; Louis Hansen, 109; Ray Nelson, 104. Engineers' scores were: Charles Link, 111; Art Jens, 100; Andy Hartanov, 99;

Class of 1931 golfers pose after architects win historic battle from engineers. Standing, left to right, Art Jens, Leo Wernicke, Wally Miles, Bob Krause, Lou Hansen, Oz Cook. Seated, left to right, Elmer Holin, Art Hartanov, Ed Paschke, Chuck Link, Joe Westenberg and Al Mell.

Following the annual banquet this group of celebrating '31ers posed for the ENGINEER cameraman. First row, W. Drigot, E. W. Shoan, L. E. Wernicke, A. H. Jens, A. L. Mell, E. T. Holin, E. E. Paschke, C. M. Schock. Second row, W. Miles, D. J. Iverson, K. E. W. Hellsen, M. M. Moss, A. Montesano, C. Blahna, L. H. Dicke, A. J. Aukers. Top row, N. R. Rosen, R. M. Krause, C. T. Link, A. E. F. Johnson, A. S. Hartanov, T. C. Foin, W. C. Marker, E. A. Olson, L. Hansen.

Joe Westenberg, 120; Leo Wernicke, 111; Ed Paschke, 105. Referee: J. Warren McCaffrey, 100.

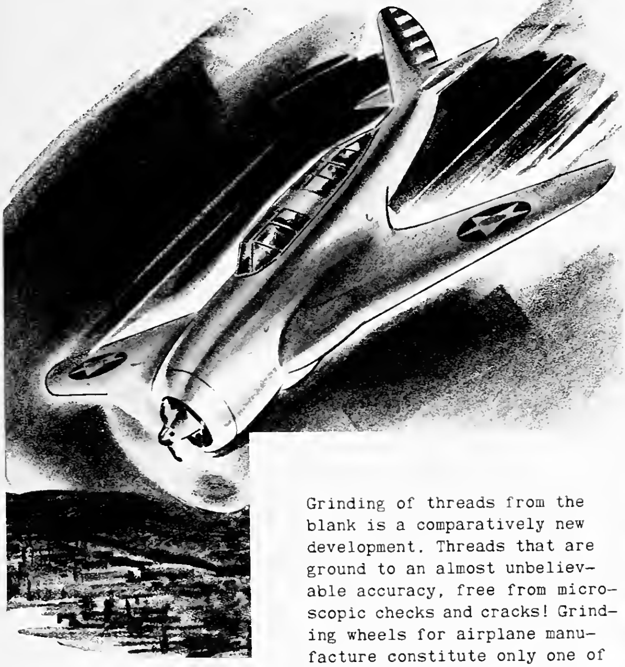
To complete the day for the architects, Elmer Holin won a very handsome portable radio for low gross score. His teammate Al Mell won the blind bogey prize, a weather guide. A drawing for other prizes was held and again the architects took home the lion's share of the awards.

As a finale more than forty men turned out for the rendezvous held in the Red Room of the Knickerbocker just prior to the alumni banquet. Those in attendance included: Civils—D. J. Iverson, L. H. Dicke, L. E. Wernicke, Phillip Jordan, K. E. W. Hellsen, W. J. Santina, E. A. Olson, R. H. Windbigler. Mechanicals—R. M. Krause, J. F. Borrowdale, R. B. Collins, A. S. Hartanov, A. E. F. Johnson, C. T. Link, M. J. Lamka, H. B. Weis, F. F. Strassenberg. Chemicals—A. J. Aukers, J. E. Westenberg, A. Montesano, W. C. Marker, T. O. Foin. Electricals—E. E. Paschke, C. Blahna, W. Drigot, M. M. Moss, O. R. Murphy, R. Patzelt. Fire Protects—A. H. Jens, W. E. Schirmer. Architects—E. T. Holin, O. J. Cook, L. L. Hansen, A. L. Mell, C. M. Schock, T. Doane, W. Miles, M. H. Braun, E. J. Minx, R. Bergquist, E. W. Shoan, N. R. Rosen, A. J. DeLong.

The committee in charge of arrangements consisted of Elmer Holin, Ed Paschke, Bob Krause, Dan Iverson, Al Aukers, and Art Jens.

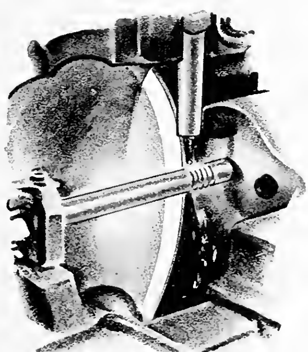
In reading Class Notes you will find that departmental designation has not been included in some instances. This is done to differentiate between graduates of the Institute and those who were former members of the class but did not graduate. It is our belief that activities of classmates, whether graduates or not, should have space in these pages and they will be included in future issues of the ENGINEER.

What holds a dive bomber together at 500 M.P.H.?



The answer is design and construction and materials and craftsmanship. But accuracy and finish of parts are also important in building a plane to withstand terrific speeds and that depends on grinding. Vibration is minimized by grinding all moving parts of the power unit to extreme accuracy. Safer and stronger threaded parts are ground with special grinding wheels such as are made by The Carborundum Company.

Grinding of threads from the blank is a comparatively new development. Threads that are ground to an almost unbelievable accuracy, free from microscopic checks and cracks! Grinding wheels for airplane manufacture constitute only one of many contributions made to industry by Carborundum during its fifty-year existence.



In fact there isn't an industry that has not been benefited by grinding. No matter what industry you go into after graduation, you may run into a grinding problem. And Carborundum Engineering Service will be ready to help you solve it! The Carborundum Company, Niagara Falls, New York.

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CARBORUNDUM
ABRASIVE PRODUCTS
50 YEARS OF SERVICE TO ALL INDUSTRY

1896

Gaytes, Herbert, is a consulting engineer with offices at 111 Sutter Street, San Francisco, California. His home address is 395 Vernon Street, Oakland, California.

1897

Moskovics, Frederick Ewan, M.E., is industrial consultant, U. S. Army Air Corps, Wright Field, Dayton, Ohio.

1899

Matthews, William D., E.E., is engineer with the Improved Risk Mutuals, 60 John Street, New York City, and resides at London Terrace, 405 W. 23rd Street, New York City.

Starkweather, Edd V., E.E., is superintendent of the Improved Risk Dept., Royal Insurance Company, 150 William Street, New York City. His residence is at 63 N. Munn Avenue, East Orange, New Jersey.

White, E. Cantelo, M.E., is president of the Ansonia Clock Company, 103 Lafayette Street, New York City, and resides at No. 328 Pondfield Road, Bronxville, New York.

1901

Stevens, Thomas Wood, M.E., is professor of dramatic arts, University of Arizona, Tucson, Arizona. His home address is 1206 East Linden Street, Tuscon, Arizona.

Swift, John Burnett, E.E., is a consulting engineer, 205 West Wacker Drive, Chicago, and resides at 6324 Winthrop Ave., Chicago.

1902

Postlethwaite, Berkley King, M.E., died on June 11, 1941 in West Albany, Oregon, and was buried on June 13th, exactly thirty-nine years after his graduation from Armour. He is survived by his widow and a son.

1903

Towl, Roy N., who is consulting engineer for the Park Commissioner of Omaha, Nebraska, writes that he served as Mayor of Omaha from 1933 to 1936. He resides at 506 South 57th Street Omaha, Nebraska.

1905

Ellett, Thomas Harlan, conducts architectural practice at 101 Park Avenue, New York City, New York. He resides at Garrison-on-Hudson, New York. He writes, "First grandchild born April 12. See 'Who's Who'."

1906

Krum, Howard Lewis, E.E., consulting engineer for the Teletype Corporation, is now located on the West Coast. His new address is 809 North Alpine Drive, Beverly Hills, California.

Strube, Harry L., M.E., was appointed chief engineer of the Link-Belt eastern division with headquarters at the Philadelphia plant. Strube has been assistant chief engineer at Philadelphia, having begun his Link-Belt service in the engineering department of the company's Pershing Road Chicago plant in 1910.

1907

Hoffman, Balthasar, Ch.E., is Right-of-Way Agent for the State Highway Commission of Indiana, Indianapolis, Indiana. He may be reached at R. 4, Valparaiso, Indiana.

1908

Morey, Clive R., E.E., is district manager for the Northwestern Public Service Company in charge of company operations for Aberdeen and surrounding territory, Aberdeen, South Dakota. He resides at 1303 South Main Street, Aberdeen, South Dakota.

1909

Grassby, G. A., Jr., M. E., has recently accepted the position of educational director with the Bendix Products Division of Bendix Aviation Corporation. He is residing at 406 E. Eckman Street, South Bend, Indiana.

1911

Beaudry, Ralph L., Arch., is now with the War Dept. as associate architectural engineer. He is located at the Elwood Ordnance Plant and is living at 10053 Forest Avenue, Chicago.

Butler, Horace L., C.E., reports that he now holds the position of senior engineer with the Illinois Commerce Commission. His home address is 833 Walnut Street, Springfield, Illinois.

Drew, Walter White, E.E., who was division traffic manager for the Western Union Telegraph Co. passed away on June 24, 1941. Unknown to many is the fact that Mr. Drew was the original from whom the character, Walt, in the famous comic cartoon strip, Gasoline Alley, was taken. He is survived by a brother and two sisters.

Goldberg, David Davis, M.E., is sales manager, Cone Valve Division, Chapman Valve Manufacturing Company, Indiana Orchard, Massachusetts. His home address is now 749 Farmington Avenue, Indian Orchard, Massachusetts.

Jones, Harvey W., C.E., who is chief engineer, S. J. Groves & Sons Company, may be reached at St. Johns, Antigua, British West Indies, where he is supervising construction of the U. S. Army Air Base.

Llewellyn, Kenneth, is chief engineer for E. J. Brach & Sons, 4656 West Kinzie Street, Chicago. His home address is 2801 Hartzell Street, Evanston, Illinois.

Stevens, Wirt A., C.E., has recently moved to Greenwich, New York.

Struble, George H., Arch., is in the trucking business at Bedford, Indiana. His home address is 1516 15th Street, Bedford, Indiana.

Williams, Lytle Lytton, E.E., has moved his location to Shreveport, Louisiana, where he is now sales manager of the southwestern division for Bird and Son, Inc. He can be reached at 948 Elmwood Avenue, Shreveport, Louisiana.

1912

Chandler, John G., C.E., who is an engineer for Guthrie-Johnson Construction Company, Burlington, Iowa, is at present assigned to the Iowa Ordnance Plant, which is a project covering 35 square miles. He writes, "Two old Armour grads are here: Captain Larson and Lieutenant Lichton." His home address is 601 North Humphrey Avenue, Oak Park, Illinois.

Clark, Ronald Baker, C.E., is Canadian regional director for the United States Steel Export Co., 30 Church Street, New York City. Residence is at 38 Boulder Trail, Bronxville, New York.

Keeler, Harry Stephen, who has had outstanding success as author of mystery novels wrote recently to the Institute and mentioned that he has had published 32 books and that the last of these was dedicated to Professor Charles E. Paul. He may be reached at 745 Brompton Place, Chicago.

Martin, Walter G., E.E., passed away late in March 1941. He is survived by his widow.

Neufeld, Ralph, C.E., passed away on August 14, 1940.


...Just another job
U.S.

1913

Marx, Walter Louis, Ch.E., may be reached at 4140 Clarendon Avenue, Chicago.

1914

Fairclough, Stanley de Bruce, is in his 20th year of private practice as an architect at 809 Exchange Street, Chicago. He resides at 5545 South Kimbark Avenue, Chicago.

Koch, Albert Nicholas, M.E., is assistant to the president, Felt & Tarrant Manufacturing Company, 1735 North Paulina Street, Chicago, and resides at 939 Ramona Road, Wilmette, Illinois.

Turner, John W., E.E., is chief engineer, Pacific steel boiler division, U. S. Radiator Corp., Box 1488, Detroit, Michigan. His home is at 1449 Longfellow, Detroit, Michigan.

1915

Klein, Val L., operates a small cabin camp and woodworking shop at Jerome, Idaho. He served with the U. S. Marines from April 1917 to July 1919.

Moeller, Arthur, C.E., is chief clerk, industrial division, United States Gypsum Co., 807 Architects Building, Los Angeles, California.

Porter, Earl William, Arch., is managing editor of the Riverside Daily Press, Riverside, California. Residence is at 3203 Pachappa Mountain, Riverside, California.

Pulsifer, Harrie B., Ch.E., is assistant to the president of the American Metal Treating Co., 1035 East 62nd Street, Cleveland, Ohio. Residence is at 9907 Lamont Avenue, Cleveland, Ohio.

Swanson, Ivar Roy, Arch., is sales engineer for the Union Steel Products Company, Albion, Michigan. He is now residing at 610 Irwin Avenue, Albion, Michigan.

1917

Culver, M. J., is in charge of the McCormick & Deering Sales & Service Agency at Yorkton, Saskatchewan, Canada. His home address is 54 King Street, Yorkton, Saskatchewan, Canada.

Dougherty, Gerald T., Ch.E., is manager of the lubricating bulk sales for the Standard Oil Co. of Indiana, 910 S. Michigan Avenue, Chicago. Residence is at 2226 E. 69th Street, Chicago.

Hall, Kenneth V., F.P.E., is engineer-inspector for the Indiana Inspection Bureau, 320 N. Meridan Street, Indianapolis, Indiana. His home is at 4123 Park Avenue, Indianapolis, Indiana.

Prochazka, Rudolph V., E.E., according to word received by the Alumni Office passed away early in January, 1940.

Wollaston, Walter, Ch.E., is works manager for the Vega Airplane Co., Burbank, California. His home is at 1618 Sunset Plaza Drive, West Hollywood, California.

1918

Bonilla, Ricardo B., is chief statistician and engineer of the National Coconut Corp., at San Pablo, Laguna, Philippine Islands.

Crown, Victor Max, C.E., is instructor in physics at Schurz High School in Chicago. He is on leave of absence until September 1942 and may be reached at 12 Largo da Gloria, Rio de Janerio, Brazil.

Shotwell, Harold H., E.E., is production supervisor for the U. S. Army Air Corps at 8505 West Warren, Detroit, Michigan. His home address is 8125 Cheyenne, Detroit, Michigan.

Wright, Wm. Campbell, Arch., is a Major and is assistant to the engineer, 2nd Army Headquarters, War Department, U S. Army, Wescourt Building, Memphis, Tennessee. He is residing at 300 Hawthorne Street, Memphis, Tennessee.

1919

Clasen, Adolph H., is a salesman for the Herrick Refrigerator Company of Waterloo, Iowa. He is living at 1608 11th Avenue, Fort Dodge, Iowa.

Rogers, Morton Webster, is manager of the Public Utilities Commission, Carleton Place, Ontario, and lives at 8 Allan Street, Carleton Place, Ontario.

Wallace, Maurice Roy, Arch., is owner of the Wallace Paint and Appliance Co., 107 Broadway, Melrose Park, Illinois. His home address is 826 S. 17th Avenue, Maywood, Illinois.

1920

Erickson, William Noling, M.E., who is County Commisioner, Cook County, County Building, Chicago, is now residing at 1605 Ridge Avenue, Evanston, Illinois. He is also engaged in the laundry business.

Gottlieb, Marshall Daniel, M.E., is a jobber of plumbing supplies and conducts his own business at 1410 S. Michigan Avenue, Chicago. His home is at 2756 Pinegrove Avenue, Chicago.

Smely, James V., E.E., writes from Pelton House, Pelton, Durham County, England, to the Institute, in part as follows:

Gentlemen:

For the last 20 years I have been in Europe, most of the time in Czechoslovakia, where I have been doing very well, thanks to the excellent education I received at my Alma Mater.

Now I am in England, having left Prague in May 1939, after Hitler seized my free country. I had two months of his "new order" and was so impressed by it that, like many of my countrymen, I left everything, wife and four children behind, in order to be on the right side when the struggle should come.

I am engaged in development work of certain new types of coal machinery, but do not feel that I am doing enough, so I have applied to the R.A.F. for a temporary commission as an engineering officer.

I am an ex-American citizen and as such I am proud of the U.S.A. in the action they have taken and the help that America is giving to Britain and her allies. As a close neighbor of Germany I have watched her for many years. I have been a frequent visitor to Germany and I assure you that for wickedness, cruelty, sacrilege, persecution and oppression, she "takes some beating." Attila in his grave must feel like a Sunday school pupil, compared to Hitler.

The struggle is grim and deadly, we are still only partially prepared and must have your help. Be assured that the indomitable spirit of free British people will prevail. I have been in many of the hard-bombed cities and I know what I am writing about.

Sincerely yours,

J. Smely.

Titus, Armour H., Arch., is now residing at 2323 Melrose, Rockford, Illinois.

1921

Hartless, Robert B., M.E., is manager of the Hartless-Austin Linen and Towel Supply Co., 2930 W. Lake Street, Chicago. His home is at 935 N. Williams, River Forest, Illinois.

Havlick, Spenser N., M.E., is president and treasurer of the Wisconsin Wholesalers, Inc., Green Bay, Wisconsin. His home is at 1434 S. Jackson Street, Allouez, Green Bay, Wisconsin.

Petersen, George W., C.E., is civil engineer, U. S. Army Engineer Office, War Dept. in charge of Elmemdorf Field, Fairbanks, Alaska. He is residing at Anchorage, Alaska.

Sponholz, William C., Arch., who is draftsman, Skidmore, Owings & Merrill, 104 South Michigan Avenue, Chicago, has recently moved to 2249 North Campbell Avenue, Chicago.

Van Valzah, Robert W., M.E., who is chief engineer, Chicago C. W. Procurement Office, 20 North Wacker Drive, Chicago, is commissioned as a Major and on active duty for one year. He has recently changed his address to 297 Northwood Road, Riverside, Illinois.

1922

Chapin, William J., M.E., who is sales engineer for the Ladish Drop Forge Co., Milwaukee, Wisconsin resides at 3047 S. Superior, Milwaukee, Wisconsin.

Fultz, Harry T., I.A., is State supervisor of education for the Works Progress Administration, 510 N. Dearborn Street, Chicago. His home is in Palos Heights, Illinois.

Gilbertson, Gordon A., Ch. E., is superintendent, U. S. Cartridge Company, St. Louis, Missouri, has moved to 7133 Princeton Avenue, University City, Missouri.

Michels, Thomas, C.E., is structural engineer, City of Chicago, Room 207, City Hall, Chicago. Residence is at 2905 Pearl Street, Chicago.

Bissel, Woodbridge, M.E., is now production manager for the Gissholt Machine Co., Madison, Wisconsin. He may be reached at 205 Lakewood Blvd., Maple Bluffs, Madison, Wisconsin.

1923

Graicunas, Vytantas A., M.E., is in business for himself at Vaizganto, Kaunas, Lithuania.

Mayo, Robert S., C.E., who manufactures special tunnelling machinery advises that he has just moved into his own home located at 1425 Hillcrest Road, Lancaster, Pennsylvania.

Pask, Raymond J., M.E., who is regional sales manager, Servel, Inc., Evansville, Indiana, has recently changed his address to 131 S. 39th Street, Omaha, Nebraska.

Pinther, John Hoffmann, is with the Pullman Company, 79 East Adams Street, Chicago. He is living at 523 West Melrose Street, Chicago.

Proetz, Victor, is vice-president of Cosden, Inc., (architectural firm) 42 E. 57th Street, New York City, New York. He is a member of the American Institute of Architects. His home address is 38 East 52nd Street, New York City.

Spensley, James W., Ch.E., is vice-president of the Midland Constructors, Inc., 205 W. Wacker Drive, Chicago. His home is at 3848 McCormick, Hollywood, Illinois.

1924

Berry, Richard Benson, C.E., is area supervisor of work projects for Chicago for the National Youth Administration, 330 S. Wells Street, Chicago. He operates as a side line Berry's Indianhead resort at Chetek, Wisconsin. His home address is 7344 S. Drexel, Chicago.

Hardwicke, Langdon Calvert, C.E., is chief engineer, Bayonne Associates, Bayonne, New Jersey. He has changed his address to 302 Heywood Avenue, Orange, New Jersey, and writes that his company is constructing the world's largest dry dock.

Klein, Ernest A., E.E., is in the industrial sales division of the United States Gypsum Co., 807 Architects Building, Los Angeles, California.

Messer, David Louis, M.E., who is communication engineer for Montgomery Ward & Co., Chicago Avenue and Larrabee Streets, Chicago, is now residing at 1558 Juneway Terrace, Chicago, Illinois.

Solomon, Harry, C.E., who is bridge designing engineer, Bridge Division, City of Chicago, Room 1001A, City Hall, is now residing at 5140 North Central Park Avenue, Chicago.

Swartz, L. Loren, E.E., is cost analyst for the Public Service Co. of Northern Illinois, 79 West Monroe Street, Chicago, and resides at 4110 Linden Avenue, Western Springs, Illinois.

1925

Heidmann, Arthur, is a patrolman with the Chicago Park District Police Department, North Section. He lives at 4045 West Nelson Street, Chicago.

Tweedle, Charles E., E.E., writes that he now has a consulting engineering practice doing oil production engineering. His office is 813 Sterling Building, Houston, Texas. Residence is at 3515 Tangley, Houston, Texas.

Whitcombe, Earle S., F.P.E., who is assistant manager of the Hartford Fire Insurance Co., 410 N. Michigan Avenue, Chicago, resides at 221 Crest Road, Glen Ellyn, Illinois.

Wilson, Harrison D., Jr., E.E., is a Major, 108th Engineers, War Department, Camp Forrest, Tennessee.

1926

Berman, William, Ch.E., who is research chemist for Wishnick-Tumpeer, Inc., 6130 West 51st Street, Chicago, is now residing at 2654 West Ainslie Street, Chicago. He is married and has one child nine years old.

Brown, Floyd E., F.P.E., is president of the firm of Cashman, Evans & Brown, Inc., a local insurance agency, 512 Colorado Building, Denver, Colorado. He is married, has two children, and resides at 823 Monroe Street, Denver, Colorado.

Fisk, George Raymond, is a sales and estimating engineer on conveying, elevating and mechanical transmission of power equipment for the Continental Gin Company, Birmingham, Alabama. He resides at 4200 7th Avenue, South Birmingham, Alabama.

Laedarach, Arthur S., E.E., who is electrical engineer for the Standard Oil Co., resides at 1523 Amy Avenue, Whiting, Indiana.

Niemz, Richard F., Arch., is attached to the Office Chief of Staff, U. S. Army, War Department, Munitions Building, Washington, D. C. He was graduated from the Army Industrial College July 3, 1941. His home address is 5013 Fulton Street, N.W., Washington, D. C.

Schoenwolf, Fred L., E.E., is a Lieutenant in the U. S. Navy and is Yard Communication Officer at Cavite, Philippine Islands.

1927

Buchsbaum, Emanuel V., Arch., who is assistant subway designer, Department of Subways and Superhighways, City of Chicago, has recently moved to 7658 South Constance Avenue, Chicago.

Davidson, Donald B., F.P.E., who is State Agent for the Loyalty Group of Insurance Companies, 405 Peoples National Bldg., Jackson, Michigan, is now residing at 203 South Grinnell, Jackson, Michigan. He is married and has two boys.

Dean, Harry F., C.E., is assistant chief draftsman, flood control section, U. S. Engineers, Baltimore, Maryland, and resides at 634 Gorsuch Avenue, Baltimore, Maryland.

Doheny, James Jerome, Ch.E., who is an instructor for the Chicago Board of Education, resides at 4247 West End Avenue, Chicago.

Flexner, Aetley C., E.E., who is chief draftsman, Mare Island Navy Yard, Vallejo, California, writes that he enjoys his work in California but sure misses the facilities for graduate study in the evening school at Armour. His home address is 1908 Rose Street, Berkeley, California.

Harrower, John Clark, C.E., is production engineer, Eclipse Aviation Division, Bendix Aviation Corp., Bendix, New Jersey. His home is at 27 John Street, Ridgewood, New Jersey.

Heinrich, Rudolph L., M.E., who is an aeronautical engineer, United Air Lines, Oakland Airport, Oakland, California, has recently changed his address to 2914 55th Avenue, Oakland, California.

Moran, Harry T., F.P.E., is employed by Moran and Rone Insurance Agency, 220 Braniff Building, Oklahoma City, Oklahoma.

Nelson, Frank A., F.P.E., who is special agent, American Insurance Company, Box 286, Quincy, Illinois, has recently moved to 807½ Broadway, Quincy, Illinois.

Rykert, William Charles, E.E., who is mechanical designer, Union Special Machine Co., 400 North Franklin Street, Chicago, has moved to 436 South Grant Street, Hinsdale, Illinois.

Thorsen, Ewald Conrad, E.E., is sales engineer for the Trumbull Electric Mfg. Co., 564 W. Monroe Street, Chicago. His residence is at 6200 N. Hoyne Avenue, Chicago.

Weber, William F., Jr., M.E., is assistant chief engineer, Armour and Company, 1355 W. 31st Street, Chicago. His home is at 6204 S. Troy Street, Chicago.

1928

Anderson, Leslie J., E.E., is sound engineer, R.C.A. Mfg. Co., LaSalle and Michigan, Chicago. His home is at 135 W. 43rd Street, Chicago.

Beisber, Mathew F., M.E., is district manager, Line Material Co., 708 Columbian Mutual Tower, Memphis, Tennessee. Residence is at 928 University Street, Memphis, Tennessee.

Pischke, Frank Joseph, E.E., is engineer with the American Telephone and Telegraph Co., 311 W. Washington Blvd., Chicago. He lives at 4245 N. Mason Avenue, Chicago.

Tyk, George S., C.E., is assistant engineer, U. S. Engineer Office, Room 928, New Post Office, Chicago. His home is at 424 Gierz Street, Downers Grove, Illinois.

1929

Bradof, William A., Ch.E., who is foreman in the parts preparation department, R.C.A. Manufacturing Company, Harrison, New Jersey, has recently changed his address to 1 Third Street, North Arlington, New Jersey.

Golber, Myron B., M.E., who is mechanical engineer for Armour and Company, has moved to 127 Greenleaf Avenue, Wilmette, Illinois.

Johnson, Thore A., F.P.E., who is an inspector with the Illinois Inspection Bureau, 309 West Jackson Boulevard, Chicago, has recently moved to 2224 Ridgelee Road, Highland Park, Illinois.

Langdon, Richard H., who is an engineer for the Owens Illinois Glass Company, Glassboro, New Jersey, is now residing at 118 South Woodbury Street, Pitman, New Jersey.

Miles, Karl Walker, E.E., was called to active duty in the U. S. Navy in September, 1940. He is a Lieutenant, U. S. N. R. and is inspector of Naval material. His home address is 812 North Cuyler Avenue, Oak Park, Illinois.

Peterson, Vernon Albert, E.E., who is a patent attorney with Langner, Parry, Card and Langner, 53 W. Jackson Blvd., Chicago has recently moved into his own home at 144 Sunset Road, Highland Park, Illinois.

Petters, George A., C.E., is staff commodity manager, Johns-Manville Sales Corp., 22 E. 40th St., New York City. He is residing at Hastings House, Hastings-on-Hudson, New York.

Siebert, Frederick William, who is divisional engineer for the Pure Oil Company, 1306 South First Street, Minneapolis, is now living at 4709 10th Avenue South, Minneapolis.

Whitten, William Charles, who is an accountant for the Permanent Construction Company, 2712 North Holton Street, Milwaukee, Wisconsin, is married and has two children. He has been employed steadily since 1927 by Worden-Allen Company and its affiliate, Permanent Construction Company. His home address is 2548 North 45th Street, Milwaukee, Wisconsin.

1930

Caparros, Gustave E., is a research cartographer and Spanish translator for M. H. Gousha Company, 536 Lake Shore Drive, Chicago. His present home address is 4926 N. Albany, Chicago. It is interesting to note that he is the originator of the most complete road map of the Republic of Mexico.

Erland, Gustave George, M.E., is in the engineering department, Carnegie-Illinois Steel Corp., 3426 E. 89th Street, Chicago. His home is at 7628 Colfax Avenue, Chicago.

Haegale, Allen Charles, F.P.E., is now salesman for the Federated Hardware Mutuals and operates in northwestern Oklahoma. His home is at 1717 E. Cherokee, Enid, Oklahoma.

Haley, Henry R., F.P.E., who is engineer for the Insurance Company of North America, Carew Tower, Cincinnati, Ohio, is on leave of absence and is Second Lieutenant, Quartermaster Corps, 2nd Division, Fort Sam Houston, Texas. He may be reached at 570 Graham Road, Fort Sam Houston, Texas.

Johnston, Robert B., M.E., is salesman for the Armstrong Cork Co., 1627 W. Fort Street, Detroit, Michigan. Residence is at 3923 Harvard, Detroit, Michigan.

Kaye, Sigmund E., F.P.E., who is supervising engineer, Western Factory Insurance Association, 158 Pierce Building, St. Louis, Missouri, is now residing at 5309 Lindenwood, St. Louis, Missouri.

Kuklin, Abraham, Arch., is employed by the John Deere Co., Moline, Illinois, in their Engineering Department and is engaged in architectural design work. He was married a year ago.

Manske, William Robert, C.E., is pro-

duction manager, chief inspector and safety director of the American Manganese Steel division of American Shoe and Foundry Co., St. Louis, Missouri. His home is at 7254 Dartmouth Avenue, St. Louis, Missouri.

Martin, Arthur T., Ch.E., is senior inspector of ammunition and explosives for the War Dept. at the Iowa Ordnance Plant, Burlington, Iowa. Residence is at 1719 South Main Street, Burlington, Iowa.

McGuire, John J., Arch., is salesman for the American Hospital Supply Corp., 1086 Merchandise Mart, Chicago. His home is located at 1443 Rosemont Avenue, Chicago.

Montgomery, Hiram W., F.P.E., who is an inspector for Indiana Inspection Bureau, 320 North Meridian Street, Indianapolis, Indiana, has recently moved to 216 Carter, Plainfield, Indiana.

Morris, Charles E., Ch.E., is assistant superintendent, lard refinery, Armour and Company, Chicago. His home is at 6153 N. Kildare, Chicago.

Nevilier, Byron Lewis, Arch., who is instructor in Art at Leland Stanford University, was married July 2, 1940 to Miss Frances Seeley of Stanford. Residence is at 112 Mariposa, Palo Alto, California.

Otto, George H., who is an engineering geologist, Soil Conservation Service, Post Office Building, Greenville, South Carolina, is at present inventing devices for underwater sampling of sediments in reservoirs. His home address is 50 Club Drive, Greenville, South Carolina.

Paradzinski, Walter, C.E., is assistant civil engineer, U. S. Engineers, 208 Post Office Building, Sacramento, California. His home is at 3748 E. Pacific Avenue, Sacramento, California. He advises that he is married and has two very young sons.

Paul, Donald J., F.P.E., is state agent, Milwaukee Mechanics Insurance Co., Kahn Building, Indianapolis, Indiana and resides at 4315 Carrollton Avenue, Indianapolis, Indiana.

Ransel, Joseph A., Arch., is assistant superintendent, mason department, Carnegie-Illinois Steel Corp., Gary, Indiana. His home is at 763 Buchanan Street, Gary, Indiana.

Rasmussen, Frederik A., C.E., is instrument man, Elwood Ordnance plant, Sanderson and Porter, Wilmington, Illinois. Residence is at 215 W. Chippewa Street, Dwight, Illinois.

Steck, Leon J., C.E., is agricultural economist with the U. S. Department of Agriculture and resides at 6428 31st Place, Washington, D. C. He received the degree of Master of Science from the American University in 1933.

Williams, Robert R., C.E., is civil engineer, constructing quartermaster, War Dept., Fort Sheridan, Illinois. Residence is at 102 S. Butrick Street, Waukegan, Illinois.

Young, Robert L., is laboratory aide at Rock Island Arsenal Laboratory, Rock Island, Illinois. He is married, has two children, and operates a photographic studio in his home at 1612 18th Avenue, Rock Island, Illinois.

1931

Abramson, Ralph J., E.E., is design and estimating engineer for Hipskind Heating and Plumbing Co., 1725 Winter Street, Fort Wayne, Indiana. His home is at 2040 Henrietta, Fort Wayne, Indiana.

Fetterman, Donald M., E.E., who is vice-president in charge of engineering for the Sonora Radio and Television Corporation, 325 North Hoyne, Chicago, is married and resides at 3340 North Laramie Avenue, Chicago.

James, Frank M., F.P.E., is employed in the capacity of inspector in the Department of Safety and Fire Protection at the E. I. DuPont de Nemours Powder Plant, Charlestown, Indiana. He resides at 507 Whitney Avenue, Louisville, Kentucky.

Larsen, Carl Albert, C.E., is assistant naval architect, David Taylor model basin, U. S. Navy Dept., Carderock, Maryland. Residence is at 4994 Newport Avenue, Washington, D. C.

Lenke, A. Julian, F.P.E., who is special agent for the National Fire Insurance Co., 42 E. Gay Street, Columbus, Ohio, makes his home at 4191 N. High Street, Columbus, Ohio.

Lindemann, George E., E.E., who is instrument design engineer, Republic Flow Meters Company, 2240 Diversey Parkway, Chicago, has changed his address to 1817 North Mulligan Avenue, Chicago.

Miran, Walter M., F.P.E., recently changed his mailing address to 1525 Carew Tower, Cincinnati, Ohio. He is an engineer for the Insurance Co. of North America.

Munch, Fred T., M.E., is now safety engineer, Vultee Aircraft, Inc., Berry Field, Nashville, Tennessee. Residence is at Cumberland Circle, Donelson, Tennessee.

Podlipec, Frank John, Ch.E., is distillation foreman, Barrett Company, Edgewater, New Jersey. Residence is at 8817 2nd Avenue, North Bergen, New Jersey.

Rimmke, Hugh, Ch.E., was employed in the spring of this year by the Illinois Division of Sanitary Engineering at Springfield, Illinois.

Schrader, William A., E.E., who is acting senior air carrier inspector (radio), Civil Aeronautics Administration, La Guardia Field, New York, is residing at 8 Castleton Court, Oceanside, Long Island, New York.

Stevenson, Richard Harrington, M.E., is now employed by Giffels and Vallet, Inc., and is located at the Kingsbury ordnance plant at La Porte, Indiana. He may be reached at 110 First Street, La Porte, Indiana.

1932

Beale, Frederic Schrob, E.E., was married on May 21st, 1941 to Miss Margaret Irene Crowley of Albuquerque, New Mexico, and can be reached at Box 2661, Boise, Idaho.

Bills, George H., E.E., is a member of Company A, 55th Quartermaster Regiment, Normoyle Depot, San Antonio, Texas.

Jungels, Alton J., M.E., who is sales engineer for the Bryant Heater Co., 17825 St. Clair Avenue, Cleveland, Ohio, has changed his residence to 17022 Kenyon Road, Shaker Heights, Cleveland, Ohio.

Knox, Edwin H., F.P.E., who is special agent for the Crum and Forster Insurance Cos. in Wisconsin announces that an adopted son, Jeffery Allen Knox is now a member of his household.

Mueller, Armin Joseph, F.P.E., has been promoted to state agent for the America Fore Group of Insurance Com-

panies and will maintain headquarters at Jackson, Michigan.

Owen, John C., M.E., is in the sales dept., The Harris Calorific Company, 5501 Cass Avenue, N.W., Cleveland, Ohio. He is residing at 1279 Hathaway Avenue, Lakewood, Ohio.

Poetzl, Ray William, E.E., who is electrical engineer, Bendix Products Division, Bendix Aviation Corporation, 401 North Bendix Drive, South Bend, Indiana, has recently changed his address to 326 South Michigan Street, Plymouth, Indiana.

Richter, Harry Paul, C.E., who was recently promoted in the real estate dept. of the Carnegie-Illinois Steel Corp. from the Chicago to the Pittsburgh office, has made his home at 125 Baywood Avenue, Mount Lebanon, Pennsylvania. Richter has given valuable assistance in preparing alumni copy for the Engineer and will continue as associate alumni editor.

Venema, Maynard P., Ch. E., although working in the office of Bacon & Thomas, Attorneys, is still employed by the Universal Oil Products Company, having been transferred from their Chicago office to Washington, D. C., in February. His address is 510 Shoreham Building, Washington, D. C.

Weston, Andrew H., E.E., is now in the engineering dept. of the Commonwealth Edison Co. and resides at 1400 E. 53rd Street, Chicago.

West, Robert Jamison, is an electrical engineer for Sears, Roebuck & Company, 925 South Homan Avenue, Chicago. He is the editor of various training manuals and bulletins for Sears. His home address is 4620 Lake Park Avenue, Chicago.

Yount, Howard Wesley, F.P.E., who is state agent for the Eagle Star Insurance Co., 175 W. Jackson Blvd., Chicago, has moved to 5310 W. Fulton Street, Chicago.

1933

Booth, William Gordon, Jr., Ch.E., who is assistant branch manager for the Union Special Machine Co., 1127 Pine Street, St. Louis, Missouri, writes that a son William Gordon 3rd was born on April 1, 1941. Residence is at 7548 Ethel Avenue, Richmond Heights, Missouri.

Curran, Edward Lawrence, Jr., F.P.E., who is a sprinkler engineer for the Mountain States Inspection Bureau, 801 Gas & Electric Building, Denver, Colorado, has recently moved to 1244 Dexter Street, Denver, Colorado.

Davies, Wilfred W., Arch., who is a research engineer for the United Air Lines was interviewed on June 15, 1941, by Bob Hawks on the "Take it or leave it" program. Davies mentioned that his work involved the measurement of cosmic rays at altitudes up to 26,000 feet.

McLane, John R., Arch., who operates his own architectural office at 123 East First Street, Dixon, Illinois, and resides at 406 East Everett Street, Dixon, Illinois.

Pihl, Stanley E., M.E., who is resident engineer for the Liberty Mutual Insurance Co., 333 N. Pennsylvania Street, Indianapolis, Indiana, now resides at 437 E. 38th Street, Indianapolis, Indiana.

Ream, Altus M., Ch.E., is assistant technical director, Ecusta Paper Corp., Pisgah Forest, North Carolina, may be reached at Box 169, Brevard, North Carolina.

Snapp, Dean Baer, F.P.E., who is special agent, American Insurance Company, 820 Pierce Building, St. Louis, Missouri, has recently changed his address to 614 North 10th Street, East St. Louis, Illinois.

Vanderporten, Stephen Ashley, F.P. E., who is an inspector with the Michigan Inspection Bureau has been transferred to the Grand Rapids branch office. His home is at 1437 Robinson Road, S. E., Grand Rapids, Michigan.

Wilson, Donald Gordon, E.E., is electrical design engineer, Consolidated Aircraft Corp., San Diego, California. He has recently changed his address to 5076 College Place, San Diego, California.

1934

Banta, Dean L., Arch., is architectural draftsman with John W. Maloney, 1117 Larson Building, Yakima, Washington. His home is at 212 N. 7th Street, Yakima, Washington.

Clarkson, Clarence Wood, E.E., is electrical engineer in the construction division, office of the Quartermaster General, District Building, Washington, D. C. He was married to Miss Betty Lawrence of Freeport, Illinois, on June 28, 1941. Residence is at 4330 37th Street, N. W., Washington, D. C.

D'Alba, Louis, C.E., was married on March 29, 1941, to Miss Esther Bernstein of Chicago. D'Alba is with the U. S. Engineer Office, Room 29, Custom House, Charleston, South Carolina.

Ekroth, Roy A., Arch., is now an architect with Graham, Anderson, Probst & White, and is located at Borinquen Field, Puerto Rico. He states Henry Martorano, Arch., Class '34, is also working there. His home address is 4837 North Hamlin Avenue, Chicago.

Gibson, Bernard N., Arch., is glass salesman, W. P. Fuller Co., 135 N. Los Angeles Street, Los Angeles, California. Residence is at 1945 San Marino, San Marino, California.

Hoffman, Edwin Gustave, C.E., who is assistant engineer, U. S. Engineer Office, War Department, St. Louis, Missouri, has recently changed his address to 6922 Plateau, St. Louis, Missouri.

Lukas, Michael A., F.P.E., is now special agent for the Niagara and American Eagle Insurance Co., in Indiana.

Lukey, John Bernard, M.E., is machine design engineer, Kearney and Trecker Corp., West Allis, Wisconsin. His home is at 2422 W. Medford Street, Milwaukee, Wisconsin.

Machinis, Peter A., C.E., is assistant civil engineer, War Dept., Kankakee ordnance works, Joliet, Illinois. He makes his home at 6643 Drexel Avenue, Chicago.

Manson, David S., is now private, Company A, 11th Battalion, Fort Knox, Kentucky. For mail: 6614 South Marshfield Avenue, Chicago.

McDonough, Edward William, M.E., who is engineering salesman, Air Associates, Glendale, California. Residence is at 1140 Westwood Blvd., Los Angeles, California.

Prahin, Edward Joseph, C. E., is with the Lockheed Aircraft Corp., Burbank, California and resides at 11283 Camarillo, North Hollywood, California.

Scharing, William G., C.E., who is with the Minneapolis - Honeywell Regulator Company, 433 East Erie, Chicago, has recently changed his address to 2450 North LeClaire Avenue, Chicago.

Schreiner, John E., C.E., is field engineer, Great Lakes Dredge and Dock Co., Box 447, Peoria, Illinois. His home is at 1504 Washington Blvd., Chicago.

Shermer, Carl L., C.E., is now assistant engineer with the Upper Mississippi Valley Division of the U. S. Engineers, St. Louis, Missouri. His home address is 1111 Graham Street, St. Louis, Missouri.

Stormer, Raymond W., is sales manager for the Empire Electric Company, 817 Main Street, Cincinnati, Ohio. He is married and has a little daughter 3 years old. He has recently purchased a new home at 7204 Hiawatha Avenue, Mariemont, Ohio.

Svoboda, Emil Anton, M.E., is now residing at 707 College Colonial Court, Indianapolis, Indiana.

Thompson, Paul James, E.E., is budgets and control manager for Montgomery Ward and Co., Fort Worth, Texas. His home is at 3700 Potomac, Fort Worth, Texas.

1935

Christoph, Albert E., M.E., who is an acceptance engineer for Western Cartridge Company is now residing at 7329 Burrwood Drive, Normandy, Missouri. His duties are to inspect and pass upon machinery on manufacturer's floor before giving permission to ship.

Delang, Theodore G., Ch.E., who is compounder and development engineer for the U. S. Rubber Company, Detroit, Michigan, has been residing at 4706 Nottingham Road, Detroit, Michigan. He advises he is building a home at 548 Chesterfield Road, Birmingham, Michigan.

Kerlin, Lester Raymond, F.P.E., is production engineer, Royal Insurance Co., Ltd., 175 W. Jackson Blvd., Chicago. His home is at 1714 W. 71st, Chicago.

Lester, Albert W., C.E., who is draftsman for The Petersen Oven Company, 300 West Adams, Chicago, resides at 4814 West 18th, Cicero, Illinois. He is married and has one son, 3½ months old.

Mayerowicz, Henry Leon, M.E., is now air conditioning design engineer, Kroeschell Engineering Company, 215 West Ontario Street, Chicago. He married Miss Marie Fischer, May 17, 1941, and is residing at 7516 Harrison Street, Forest Park, Illinois.

Schnackel, Charles A., Ch.E., who is supervisor, Western Electric Company, Chicago, is now residing at 6834 West Medill, Chicago.

Sims, Stanley, M.E., is piping designer for the Standard Oil Company, 910 South Michigan Avenue, Chicago and resides at 2554 W. 70th Street, Chicago. He is the father of a baby boy.

Stocking, Kenneth Orin, C.E., who is junior engineer, U. S. Engineer Office, 1709 Jackson, Omaha, Nebraska, is now residing at 205 North 48th Street, Omaha, Nebraska.

Szantay, Elmer Daniel, is president of the Sandee Manufacturing Company, 3945 North Western Avenue, Chicago. He writes that his work is in the new field of plastic extrusion. He is living at 6157 North Knox Avenue, Chicago.

Young, Donald Erwin, E.E., is engineer-supervisor, maintenance division, Carnegie-Illinois Steel Corp., 3428 E. 89th Street, Chicago. Residence is at 17916 Sacramento, Homewood, Illinois.

1936

Beckwith, Harry, Arch., who is associate architect in the office of the Constructing Quartermaster, War Department, Civic Opera Building, Chicago, has moved to 2648 E. 78th Street, Chicago.

Bill, William, E.E., is engineer, Harper-Wyman Company, 8562 Vincennes Avenue, Chicago and resides at 6142 S. Morgan Street, Chicago.

Gartz, William Josef, M.E., is a testing engineer for Crane Company in the research and development division, 4100 South Kedzie Avenue, Chicago. His home address is 15 North Keeler Avenue, Chicago.

Johnsen, John Harold, Ch.E., who is chemical engineer, Standard Oil Company of Louisiana, has recently moved to Ma-

rion Drive, Route No. 2, Baton Rouge, Louisiana.

Larson, John O., C.E., who is resident sales engineer, The Foxboro Company, 101 Marietta Street, Atlanta, Georgia, resides at 2301 S. 15th Avenue, Birmingham, Alabama. He writes he was married in September, 1939, and there are no "exemptions" as yet.

Mozoleski, Erwin R., E.E., who is a lineman for the Illinois Bell Telephone Company, 212 West Washington Street, Chicago, is now residing at 6545 South Union Avenue, Chicago.

Nelson, Vincent Gottfred, Ch.E., who is chief inspector, Cameron Iron Works, 711 Milby Street, Houston, Texas, has recently changed his address to 4544 Rush Street, Houston, Texas.

Shirey, Eugene Leslie, E.E., who is in the electrical operating department, Chicago District Electric Generating Corp., 103rd and Lake Michigan, was married June 7, 1941, to Miss Margaret M. Boherg. Residence is at 635 E. 71st Street, Chicago.

Stevens, Myron B., F.P.E., is inspector for the Missouri Inspection Bureau, 930 Landers Building, Springfield, Missouri. He is residing at 619 East Harrison, Springfield, Missouri.

Strazz, Anthony J., C.E., is engineer for the Great Lakes Carbon Corp., 910 S. Michigan Avenue, Chicago. Residence is at 5032 Washington Blvd., Chicago.

Sumner, Hermon J., M.E., who is tool designer, Consolidated Aircraft Corp., San Diego, California, has recently moved to 2978 Fir Street, San Diego, California.

Vaillant, Benjamin, E.E., testing engineer, Chicago Flexible Shaft Company, 5600 West Roosevelt Road, Chicago, is now residing at 4144 North Avers Avenue, Chicago.

1937

Bauermeister, Herman Otto, Ch.E., has recently changed his address to 1900 "F" Street, N. W., Apartment 722, Washington, D. C.

Brink, Earle, H., E.E., who is junior engineer with the E. I. Dupont & Co., Niagara Falls, New York, was married on June 14, 1941, to Miss Antoinette Nelson. Home address is 304 Buffalo Avenue, Buffalo, New York.

Freeman, Robert K., F.P.E., who is a flying cadet, was interviewed on May 31, 1941, by Norman Ross, ace W.M.A.Q. announcer, regarding the training program required of student flyers. He was formerly an inspector with the Michigan Inspection Bureau at Detroit, Michigan.

Freund, Gustav, II, Ch.E., is vice-president, Visking Corp., 6733 W. 65th Street, Chicago, and resides at 4940 East End Avenue, Chicago.

Johnson, Bertil W., E.E., is electrical engineer, Allied Chemical Co., Hopewell, Virginia, and may be reached at 5517 Cortez Street, Chicago.

Martin, Paul Miller, E.E., is assistant manager, Northwestern Electric Company, 408 South Hoyne Avenue, Chicago. Home address is 6548 North Richmond Street, Chicago.

Nearing, Willard C., M.E., is assistant engineer, War Dept., Wright Field, Dayton, Ohio. His home is at 464 Watervliet Avenue, Dayton, Ohio.

Niemann, Reinheart F., M.E., is assistant foreman, heat treating department, International Harvester Co., 1015 W. 120th Street, Chicago. Residence is at 2130 N. 75th Avenue, Elmwood Park, Illinois.

Schreiber, Warren F., Ch.E., who is an inspector for the Chicago Ordnance District has recently moved to 4125 Belle Plaine Avenue, Chicago.

SCHULTZ, PAUL ROBERT, JR., Ch.E., who is chemical engineer for the Standard Oil Company of Indiana, Whiting, Indiana, has recently changed his address to 11107 South Hoyne Avenue, Chicago.

REIL, PAUL A., M.E., is assistant manufacturing engineer, Western Electric Co., Kearny works, 100 Central Avenue, Kearny, New Jersey. His home is at 465 Springdale Avenue, East Orange, New Jersey.

WESTERMAN, FRANK G., F.P.E., was employed by the Insurance Company of North America as Special Agent on June 15, 1941. He lives at 8349 S. May Street, Chicago.

1938

DUNBAR, CLAIRE W., F.P.E., is now stationed at Kalamazoo for the Michigan Inspection Bureau. An heir, a boy, arrived early in September. Residence is at 428 Stanwood, Kalamazoo, Michigan.

HENDERSON, ANDREW B., E.E., is inspector of engineering materials, War Dept., Wright Field, Dayton, Ohio.

MOORE, ROBERT EARL, E.E., operates the Moore Brothers Paper Co., 3412 Justine Street, Chicago. He was elected a Justice of the Peace for Worth Township in April, 1941. His home is at 9806 S. Lawndale Avenue, Evergreen Park, Illinois.

NOBLER, BERNARD, Arch., is an architect for Celotex Corp., 919 N. Michigan Avenue, Chicago, and resides at 7722 N. Haskins, Chicago.

O'CONNELL, JOHN F., JR., Ch.E., is a 2nd Lieutenant in the Air Corps and at present is located in the Philippine Islands. His home address is 424 W. 59th Street, Chicago.

QUALE, VINCENT HARRISON, E.E., is a first class private, anti-tank troop, 1st Cavalry Division, U. S. Army, Fort Bliss, Texas.

STOBER, GEORGE L., Ch.E., is manufacturing chemist, Abbott Laboratories, North Chicago, Illinois. His home is at 1418 North Avenue, Waukegan, Illinois.

STOLL, EVAN LEE, C.E., is at present in training as a Flying Cadet, U. S. Army Air Corps. Residence is at 7420 Kenwood Avenue, Chicago.

1939

BUGIEL, JOSEPH P., C.E., was recently employed by the Illinois Division of Sanitary Engineering at Springfield, Illinois.

CAPODANNO, WILLIAM J., Ch.E., sailed early in September for the West Indies where he is to begin work as an apprentice operator for Lago Oil and Transport Co., Ltd. He will locate at Aruba, Netherlands, West Indies.

COLLIER, THOMAS, C.E., is foreign sales representative for Pabst Sales Company of Chicago. His position takes him into the West Indies, Virgin Islands, Central and South America. His present home address is Apt. 31, Condado Apartments, Santurce, Puerto Rico.

FRIED, ARTHUR NATHANIEL, Ch.E., is assistant procurement inspector for the War Dept., U. S. Army Air Corps, Material Division at the Allison Engineering Corporation, Indianapolis. He resides at 1213 North New Jersey Street, Indianapolis, Indiana.

HENRIKSEN, PAUL F., M.E., has recently moved to 58 Maple Avenue, Lebanon, Ohio.

JACOBSON, DANIEL W., F.P.E., is employed by the Illinois Inspection Bureau. He and his wife recently purchased a home in Addison Township, DuPage County, Illinois. His mailing address is R.F.D. No. 1, Elmhurst, Illinois.

JOHNSON, HAROLD C., Ch.E., who is chemical engineer, Armour & Company, U. S. Yards, Chicago, is now residing at 5946 Cornelia Avenue, Chicago.

MILLER, SAMUEL P., M.E., is stress analist for Consolidated Aircraft Corp., Lindbergh Field, San Diego, California. His home is at 3634 3rd Street, San Diego, California.

PATER, ANTON S., Ch.E., is research engineer, the Prest-O-Lite Company, Indianapolis, Indiana. His home is at 5034 W. 15th Street, Indianapolis, Indiana.

SPENCER, SAM CHRISTOPHER, Ch.E., is chemical engineer, Joseph E. Seagram and Sons, Inc., Lawrenceburg, Indiana. He may be reached at 8913 S. Justine Street, Chicago.

VAN ALSBURG, EARL R., M.E., advises that he was married on March 31, 1941, to Miss Iola Godard of Anna, Illinois. Residence is at 1107 28th Street, San Diego, California.

1940

ANDERSON, FLOYD E., E.E., who is a junior electrical engineer, Navy Department, Bureau of Ships, Navy Bldg., Washington, D. C., is now residing at 3821 "V" Street, S. E., Washington, D. C. He was married in April, 1941.

BRANNICK, EDWARD J., F.P.E., has been transferred by the Fire Insurance Rating Bureau to the branch office at Wausau, Wisconsin. His home is at 706 First Street, Wausau, Wisconsin.

CALDWELL, WILLIAM M., E.Sc., is employed by the Carnegie Illinois Steel Corp., Gary, Indiana, the Metallurgy Department. He lives at 11741 Main Street, Harvey, Illinois.

COHEN, JACOB IRVING, E.E., is employed by the Navy Department in Washington, D. C.

DEMENT, CLAYTON W., F.P.E., who is fire insurance inspector for the Illinois Inspection Bureau, 809 Jefferson Building, Peoria, Illinois, has taken up residence at 605 North Madison, Peoria, Illinois.

ELLIN, FREDERICK L., E.E., is employed as an engineer with the Ohmite Manufacturing Co., 1835 West Flournoy Street, Chicago. Residence is at 5635 Cottage Grove Avenue, Chicago.

EPSTEIN, LEON S., M.E., is in the Navy Department, Bureau of Ships, in Washington, D. C. He resides at 111 Anacostia Road, S. E., Washington, D. C.

FROST, GEORGE EDWARD, E.E., writes from 2111 H. Street, N. W., Washington, D. C., the following interesting letter:

Gentlemen:

It doesn't seem possible that a whole year has passed since commencement last year. Chicago and Armour, I mean Illinois Tech., seem in the dim past.

From all I hear things are fine there at school. People here are quite conscious of developments and know quite a bit about the Armour-Lewis merger. It is especially interesting to me to see the part the school is playing in the national defense program.

Two weeks ago I was transferred to the patent department and moved down here to Washington. Although the town is clean and not too large it is not nearly as pleasant as Schenectady was. The company sends a few men here every year to search existing patents for conflictions with various proposals of the engineers. We stay here four years and attend law school evenings so that at the end of the time we have law degrees as well as our engineering training.

You may be interested in knowing that Floyd Anderson ('40 E.E.) is married and working in the Navy department here.

Good luck to you all at Armour.

Sincerely yours,

GEORGE FROST.

HEENAN, SIDNEY A., Ch.E., who is in the works laboratory of the General Electric Company, Bridgeport, Connecticut, is now residing at 753 E. Broadway, Milford, Connecticut.

HERDMAN, DONALD FLOYD, E.E., is working with the Navy Department in Washington, D. C.

HUNTER, THOMAS ALEXANDER III, F.P.E., who is an inspector for the Western Factory Insurance Association, Cincinnati, Ohio, has recently changed his address to 2368 Victory Parkway, Cincinnati, Ohio.

LASKOWSKI, CLARENCE, C.E., is office engineer, E. I. DuPont de Nemours and Co., Charleston, Indiana. His home address is 1018 East Maple Street, Jeffersonville, Indiana.

KOTULLA, NORBERT J., Ch.E., is an operator for Joseph E. Seagram, 114 Ridge Avenue, Lawrenceburg, Indiana and resides at 2852 N. Merrimac Avenue, Chicago, Illinois.

MAXWELL, ROBERT BLANE, JR., F.P.E., is inspector, Missouri Inspection Bureau, 1201 Gloyd Building, Kansas City, Missouri. For mail: 7320 North Ashland Avenue, Chicago.

MINIEKA, EDWARD T., M.E., is junior field engineer, Commonwealth Edison Co., Chicago. His home is at 3303 S. Lowe Avenue, Chicago.

SANDIFORD, HOWARD, Ch.E., died June 29th in the Chicago Memorial Hospital of burns suffered June 11th when he fell down a stairway of the E. F. Houghton & Company plant where he was employed as an engineer. He lived at 1621 Montrose Avenue, Chicago.

SCOTT, ROBERT W., M.E., is experimental test engineer for the Wright Aeronautical Corp., Paterson, New Jersey. His home is at 420 Valley Road, Upper Montclair, New Jersey.

SHAVER, JOHN D., E.E., was inducted into the U. S. Army, January 8th, 1941, and has been located in the Machine Records Unit at Chicago and at the Casual Detachment, Fort Sheridan, Illinois, but is now back in Chicago.

SHER, HERBERT, Ch.E., is employed by the Carnegie Illinois Steel Corp., at South Chicago in the Blast Furnace Metallurgy Department.

STERNFELD, BERNARD ROSS, M.E., is junior instructor of aircraft hydraulic systems, Army Air Corps, Chanute Field, Illinois. He may be reached at 4516 W. Congress Street, Chicago.

TANNENBAUM, FRANK S., who is a draftsman in the Navy Department, 17th and Constitution, N. W., Washington, D. C., was married on June 15, 1941, to Miss Zelda Allswang of Chicago. He resides at 629 "H" Street, S. W., Washington, D. C.

WEBER, RUPERT J., JR., C.E., expects to complete his preliminary training at the Naval Air Station, Miami, Florida. He may be reached at 6346 N. Hermitage Avenue, Chicago.

WEINECKE, LAWRENCE ALBRECHT, Ch.E., is pressure still inspector for Cities Service Oil Co., East Chicago, Indiana. His home is at 1510 E. 62nd Street, Chicago.

1941

GRAHAM, ROBERT K., M.E., a flight cadet at Cimarron Field, Oklahoma City, recently named a battalion commander, died June 11, 1941, in the crash of his training plane near Yukon, Oklahoma. He is survived by his mother and father, Mr. and

Mrs. Andrew C. Graham, 7840 Throop Street, Chicago, Illinois.

KOLODY, MARION, E.E., is a private in the U. S. Army, stationed at Fort Knox, Kentucky. For mail: 5218 Winnemac Avenue, Chicago.

KULIEKE, FREDERICK C., JR., M.E., is a design draftsman, mechanical engineering department, American Steel Foundries, 1001 East Broadway Street, Alliance, Ohio. He is residing at 723 South Arch Street, Alliance, Ohio.

MONSON, DONALD, Arch., recently won the 1941 Edward Langley scholarship of the American Institute of Architects. He is living at 4926 Kimbark Avenue, Chicago.

OLSON, ROBERT WESLEY, C.E., is an engineer for the Kimberly-Clark Corporation, Neenah, Wisconsin. He is residing at 136 West River Drive, Appleton, Wisconsin.

PETERSON, RICHARD ALWIN, M.E., is an aviation cadet, U. S. Army, aviation cadet detachment, Chanute Field, Rantoul, Illinois. For mail: 2321 North Lamon Avenue, Chicago.

PETERSON, ROBERT AUGUST, E.E., is laboratory engineer, Magnaflux Corporation, 5908 Northwest Highway, Chicago. He has moved to 4308 North Keystone Avenue, Chicago.

PFEFFER, FRANK PETER, M.E., who is assistant inspector of materials, Chicago Ordnance District, 38 South Dearborn Street, Chicago, has recently changed his address to 1610 Granville Avenue, Chicago.

PLOWMAN, JAMES W., F.P.E., is inspector, Ohio Inspection Bureau, Columbus, Ohio. For mail: 121 North 7th, Hannibal, Missouri.

RAMP, ROBERT LOUIS, E.E., who is conducting radio research and special development in the Naval Research Laboratory, Washington, D. C., is now residing at 6514 Brennon Lane, Chevy Chase, Maryland.

REIMER, GERHARD MARTIN, M.E., is test engineer, Swift & Company, Chicago. He has recently moved to 6608 South Wolcott Avenue, Chicago.

RING, JOHN FRANCIS, E.E., is in the construction department, Bethlehem Steel Company, Sparrows Point, Maryland. His home address is 2727 Liberty Parkway, Dundalk, Maryland.

RUNQUIST, ERNEST MARTIN, M.E., is chief engineer, R. I. Ederer, 540 Orleans St., Chicago, and is residing at 871 Ernst Court, Chicago.

SANOWSKIS, ALBERT CLARENCE, Ch.E., is a training course student at the Revere Copper and Brass, Inc., Rome, New York. His home address is 2639 West 44th Street, Chicago, Illinois.

SCHWARTZ, SEYMOUR, Ch.E., who is inspector, Navy Dept., Newport News, Virginia, is now residing at 8703 3rd Ave., Brooklyn, New York.

FIRE DEFENSE

(From page 6)

One should start with the assumption that any building of a plant by the most adverse combination of circumstances may be completely destroyed by fire. This is especially important in war time when abnormal conditions may be expected. The manufacturing processes must therefore be arranged so that loss of one or more buildings does not cripple production. Even where a continuous process is employed, it is generally possible to arrange multiple production lines separated so that a fire affecting one would not affect the others.

The exact type of construction of a building is less important than the way the building is arranged, that is, the opportunities that are offered for the spread of fire from floor to floor, from one end of the building to the other, and from building to building. Stairways and elevator shafts must have enclosures around them to provide a positive separation between floors. Horizontal spread of fire is restricted by the limitation of areas between fire walls. Fire walls have fire doors where there are unavoidable openings. Fire shutters are provided at exposed or exposing windows.

There is a practical limit to what can be done by these measures. Fire walls cannot be put in every few feet. Building construction cannot always be 100 per cent "fireproof." Stock in process is usually combustible and must be present in relatively large amounts. The method universally used to offset these limitations of industrial property is the installation of automatic sprinklers. Sprinklers are installed in practically all important manufacturing plants and most warehouses.

While it is clear that the most immediate problem of fire safety is in industrial properties, there is no reason to ignore the problem of air-set fires, as preparations to meet and minimize the consequences of air attacks can only be effective if made well in advance. There is much debate as to the likelihood of extensive bombing of cities, but it would be the height of folly not to consider this as a possibility.

The possibility of air raids is being studied at all of the levels of government—federal, state and local. A federal Office of Civilian Defense has been established under the Office for Emergency Management. State defense councils have been established in nearly all of the states and the organization of local councils is being carried on with vigor, particularly in the easternmost part of the country.

The pattern of most state defense plans is a general council or committee charged with all phases of civilian defense. A subordinate division or committee is charged with the responsibility for fire matters. The local pattern is similar.

In the formation of state and local bodies, there is a principle which is

in general being followed. Each such council and committee requires an executive. The executive responsibility for fire defense operations in most cases is placed in the hands of the same executives charged with this responsibility in peace time. The advantage of this is that the local fire chief or other responsible executive is able to go ahead with suitable plans in event that the council or advisory committee does not move.

Typical of the problems which state defense councils must solve is that presented by the protection requirements of a metropolitan area. Enemy bombers are not likely to pay much attention to the boundaries of local political government. The fire service in such areas must be organized to function as a unit.

There are a number of problems, legal and technical, to be solved to make protection effective in such cases. In normal times two communities, both having fire departments, can give mutual aid one to the other in the case of large fires. An unprotected community receives outside aid when a fire department from a nearby community comes to its assistance. It is necessary to authorize such outside aid and mutual aid by legislation in most states. The liabilities and responsibilities of municipal fire departments giving and receiving such service must be determined. It is necessary to know how far this is provided for in existing law, and general forms of contracts and agreements must to worked up to cover such operations where the interests of several communities are involved.

It is also necessary to provide facilities for transmitting calls for aid between the communities. Municipal fire alarm systems must be interconnected and there must be proper organization of telephone service, police teletype and radio, fire department radio, and amateur radio. The experience in England under air raid conditions indicates that a large force of messengers must also be employed against the possibility of breakdown of normal telegraph, telephone and radio communication.

One of the things which must be done on a state-wide basis is to prepare a list of the facilities available for public fire fighting operations. This information has to be tabulated and filed for reference at convenient centers in the state and provision must be made for keeping the information up to date. Facilities so tabulated will cover such things as the number of firemen, the number of men assigned by water utilities to the work of operating valves in an emergency, water works emergency repair crews, and a detailed list of all sorts of major fire apparatus, like pumpers and ladder trucks and of hose, gas masks, rescue tools and miscellaneous other fire department equipment.

State councils will probably have to make provision for protective clothing for auxiliary firemen and perhaps give some local financial assistance in connection with food and travel allowances for volunteers engaged in training. In addition, it may be desirable for the state defense councils to establish pools of men and equipment additional to that in the regular municipal service. These pools might be located at centers from which they can give local assistance in various parts of the state as may be required.

One of the duties of the state council would be to set up local defense districts, which will usually be a municipality, township or borough. Each such local defense district must set up suitable fire defense machinery and it will be the state council's job to see that these districts are set up and that the local councils function.

The local defense council will have a coordinating job to do. For example, it must establish the relationship of the men in the regular and auxiliary fire services with the activities of others in police, medical, public utility, or transportation service. Some fire departments, for example, have special squads trained and equipped for rescue work and even with tools for doing some kinds of work in clearing away debris. It is particularly important, therefore, to have an understanding as to the amount of rescue work and work in clearing debris that will be handled by members of the fire force. Except in unusual cases, emergency crews of other men to perform these services would be provided.

Cooperation between firemen and emergency crews of various public utilities must be established. In general, for example, firemen should not cut gas and electric services. Such cutting must be done by responsible emergency crews. Inadvertent cutting off of essential services may often be avoided by this procedure. There are some technical hazards involved also. For example, restoration of gas service after interruption requires seeing that all outlets are closed.

One of the most important phases of defense operations from a fire standpoint is likely to be the work of the water utility. The water utility will have an emergency organization of repair crews to make possible the speedy repair of broken mains, but it is necessary that a plan be worked out in advance as to how breaks in water mains shall be dealt with. Such breaks require two things to be done—first, the closing of valves on both sides of the break, and second, maintaining of service through bypasses or through hose lines stretched from one hydrant to another.

An air raid sets up a condition where there are a large number of simultaneous fires—far more fires at one time than a normal fire department can deal with. This will require some expansion of fire department personnel. At the start, firemen will probably be recruited on a volunteer basis and the men will be given a training course. This will make a body of men available for duty in an emergency for fire fighting service. If an air raid emergency develops to the point which it has in England and other European countries, these volunteers may, like those in London, be put on a permanent basis to serve as regular members of the fire department.

The number of men and also the amount of fire apparatus which must be provided for its use appear to be determined by such factors as the expected intensity of air raids. Just what these raids may involve is, of course, a matter of considerable speculation. It may perhaps be estimated, however, that the intensity of possible raids may be proportional to the flying distance which enemy bombers must cover to and from their operating bases. That means that in United States cities the intensity of possible air raids is likely to be slight in inland cities and as this manuscript is prepared (in mid-summer) there is no likelihood of bases being set up close enough to our shores to make possible raids approaching the intensity of those on English cities.

Nearly everyone is asking what effect an air raid has on the fire hazard in the average home. They also want to know what there is that the average home owner can do to reduce the vulnerability of his home to incendiary bomb attack.

As a matter of fact, very little can be done to prevent incendiary bombs from occasionally landing on the roof of a dwelling house. Only a fairly substantially reinforced concrete roof several inches thick can actually stop the penetration of these bombs. A good deal can be done, however, to reduce the seriousness of any possible fire that they may start by the removal of combustible material from attics. As a safeguard against spreading fires it is desirable that when houses are reroofed combustible roofing such as wooden shingles be replaced with fire retardant types.

Most incendiary bombs are of mag-

nesium metal. When water is poured on burning magnesium, there is a violent reaction. If the water is applied in the form of a spray, however, the reaction is not so violent that one cannot approach the incendiary bomb to put out the fire. Water helps to burn the bomb up quickly thus reducing the danger. Water prevents spread of fire to surrounding combustibles.

The typical bomb is a small cylinder weighing only a couple of pounds. It can be readily handled by householders who have been given some instruction and particularly if they have been allowed to practice with extinguishers or other tools or actual bomb fires. One or two practice sessions make it possible for almost any able-bodied individual to deal with these bombs.

Householders should be encouraged to provide simple equipment for fighting fires in the home, including fire extinguishers, hand pump tanks, pails and barrels of water and sand. When an incendiary bomb falls in the house, there are several techniques that may be employed for dealing with it. If the bomb is on a wooden floor and you have sand available, a small amount of sand is dumped on the floor beside the bomb, and with a shovel or other tool the bomb is pulled over on to the small pile of sand and then in turn covered. The sand and the bomb may then be picked up in a scoop shovel and taken outside.

Another method of dealing with an incendiary bomb is to squirt water on it. The British use a stirrup pump, a device looking like an ordinary bilge pump, in a water bucket. This directs a small stream through a spray nozzle which may be used on the bombs. The hand pump tank extinguisher such as is common in the United States gives a stream which may be successfully used on incendiary bombs. The trick is to break the ordinary stream up into a rough spray by holding one's finger over the nozzle opening.

Part of the problem, therefore, will be to train householders for dealing with air set fires. They will have to be taught numerous other things, such as how persons should behave in a house which is on fire, how they may avoid panic and rescue other people, and how to put out a fire in a person's clothing.

Many people who have watched fire departments run to fires have wished that they might have the opportunity of playing at being firemen. If air raids come, they will be firemen and they won't be playing at it.

SOIL MECHANICS

(From page 12)

ments, the development of such a program inevitably resulted in the accumulation of general knowledge in connection with soil behavior and construction operations which can be expected to be useful far beyond the boundaries of the Chicago subway system. The fundamental desire of the members of the subway organization was to omit no observation which would add to the understanding of the problems met in design and construction of the project.

ACKNOWLEDGMENT

The soil mechanics program on the Chicago Subway Project was carried out by the Department of Subways & Superhighways, City of Chicago, Edward J. Kelly, Mayor. Philip Harrington is Commissioner and Ralph H. Burke was Chief Engineer throughout the major construction program. Charles E. DeLeuw is now acting Chief Engineer, and Raymond S. Knapp is in administrative charge of the Survey Section, including Soil Testing. Dr. Karl Terzaghi is consultant in matters pertaining to soil mechanics. The writer is in direct charge of the Soil Mechanics Program, including the measurements described above.

NEW PUBLICATION

(From page 22)

be reprinted in the series. The objective to be served by each number is to make available a group of papers related to each other and therefore of value to libraries for general reference when bound together.

The Graduate School of Illinois Institute of Technology encourages research by the faculty and provides facilities for special investigations. Research projects may be sponsored by outside agencies. The criterion upon which the appropriateness of all projects is judged is that the research shall serve the general interests of the public. As such, the publication of the final results of such research is encouraged by the Graduate School. Whenever important research data do not find a ready source of publication in the scholarly or professional journals, the Graduate School will consider their publication in a special bulletin.

It is expected that the new publication, under the guidance of a committee of the faculty, will appear about four times each year. The numbers on *Mathematics* and *Mechanics* have received favorable comment and the third will be issued at an early date.

AERONAUTICAL

(From page 23)

It might be well to remember that at this early stage of flying there was very little known of the external forces, as practically no reliable data had been obtained. Consequently, the ships were not designed; they grew under the hands of the mechanics.

A course in aerodynamics was offered as an elective in Civil Engineering as early as February, 1910, eleven men registering for that semester. It was decided to use as a text *Aerodynamics* by F. W. Lanchester, published in England in 1908, supplemented by notes taken in the field and by other articles gathered from the library. Later, another elective in airplane design was offered. These two courses have been taught at Armour each year since that time.

The Aero Club of Illinois sponsored a great air meet which was held in Grant Park in 1912; also during this same summer Lincoln Beachy did his stunt flying, loop, power dives and pull outs, which thrilled everyone. During these thrilling exhibitions one could find Professor Wells and Sidney James (Armour '07) timing and estimating velocities and curvature of flight paths. All such data were arranged for class study.

The courses in aerodynamics and airplane design proved very attractive to students in Civil Engineering and also to some in Mechanical Engineering. Later, during the first World War Professor Daniel Roesch offered an elective course in airplane engines which was taken by Civil Engineering as well as Mechanical Engineering students.

The success of these courses is reflected by the number of Armour graduates who are now employed by the airplane manufacturers, Curtiss, Martin, Douglas, Boeing, Lockheed, and others.

On account of the activity in aeronautics and the call for men with theoretical training in airplane and engine design, Illinois Institute of Technology is offering this year, for the first time, aeronautical options in both Civil and Mechanical Engineering.

The options in these courses will include, in addition to the regular subjects, which will be changed slightly, the following:

For Civil Engineering: Differential Equations, Airplane Stress Analysis, Aerodrynamics, Meteorology, Airplane Design, Aeronautical Engines, Airport Design and Layout, and Aeronautical Laboratory.

For Mechanical Engineering: Differential Equations, Stresses in Framed Structures, Airplane Stress Analysis, Aerodynamics, Aeronautical Engines, Aeronautical Laboratory, Airplane Design and Meteorology.

The students who successfully complete the options will receive the Bachelor of Science degree in Civil or Mechanical Engineering.

INDUSTRIAL ENGINEERING

(From page 24)

ernment or through private corporations, the security of our civilization depends in no small degree on the soundness of the fundamental ethics and the adequacy of the training and thinking of the administrator and the executive. It has been predicted that, as the nineteenth century was distinguished by its progress in the physical sciences, so the twentieth century will be distinguished by its progress in the application of science to social problems. In no field is there a greater challenge to invention and creative thinking. Problems await solution on every hand, and the call, not only for students and investigators, but for men trained to apply sound principles, is already great and will increase. Only by the application of many minds and the cooperative effort of many institutions will the maximum progress be attained.

Illinois Institute, by virtue of its many industrial connections, is already qualified to render a service in this field. The new curriculum provides the opportunity and the invitation to extend this service. The responsibility is accepted.

BOOK SHELF

(From page 26)

indebted to Berle and Means than he is willing graciously to acknowledge, but he does offer interesting variations on their thesis of a decade ago.) Control of financial and personnel policies is in itself, according to the author, a form of ownership. Whether it is in the General Motors Corporation or the T. V. A., the managers are the real owners—the ones who know that they are indispensable in modern society, and the ones whose capacity for diverting both power and fortune to themselves is steadily developing. It is but a matter of months, or a few years, Mr. Burnham says, before the middle class bankers and businessmen, who four centuries ago pushed the medieval landed aristocracy aside, will themselves be elbowed into oblivion by a more confident set of rulers.

"It is perhaps worth remarking that there is an interesting piece of psychological evidence for the assured social position of the managers. The managers — these administrators, experts, directing engineers, production executives, propaganda specialists, technocrats—are the only social group among almost all of whose members we find an attitude of self-confidence. Bankers, capitalist owners, liberal politicians, workers, farmers, shopkeepers—all these display, in public and private, doubts and fears and worries and gloom. But no one who comes into contact with managers will fail to have noticed a very considerable assurance in their whole bearing. . . . Whether or not they have thought it out, they grasp the fact that they have nothing to fear from the immense social changes speeding forward over the whole world. When they begin to think, they get ready to welcome those changes, and often to help them along" (p. 281).

The author is also doing his bit to help them along. He is sounding the trumpet and trotting out the bandwagon. That he may disarm his readers and convince them that he is taking a completely objective, a "scientific" view in this matter, he assures us that he deplores this trend. Burnham claims that his interests are with those of the traditional capitalists. But such a claim is a rather feeble one when viewed in the light of the fact that under the present regime he has remained a comparatively unknown professor in one of the country's many large universities; whereas under the new wave of the future that he heralds he might well be the Lenin if not the Stalin of the movement.

The claim that this country, along with the rest of the western world, is rapidly undergoing socio-economic transition is hardly new to us. Apart from Burnham's nomenclature and his emphasis, almost every phase of this new order has been pictured for us elsewhere, but rarely in such gaudy attire. Some have called it "state socialism." But the author, all too recently departed from the Trotsky camp, insists that regardless of the degree of state ownership or control of production, there can be no socialist state without a classless society. The fact that under his new regime the managers would constitute a new aristocracy precludes the possibility of a classless society and therefore prevents the coming of what Mr.

Burnham would like to call a socialist state. Others might call this new order "state capitalism." But capitalism, says the author, is where the instruments of production are employed for profit to the owners; and under the coming managerial order of things all such outmoded customs and practices will be things of the past. Therefore, our new society will be neither socialist nor capitalist, but a managerial state with a new aristocracy of managers who will control the instruments of production and divert the lion's share of goods and services to themselves.

In spite of this quibbling with terms, the author is using his pet "managerial society" in a broad and generic sense. Both the Russian and the German states he includes in this category. And both of them claim to be forms of socialist states. It is conceivable that in this country the thing might be labeled "national capitalism." But in the current vernacular, "no matter how you slice it, it is still the same boloney." It will be easier for most of us to agree with the author's nomenclature than it will be to accept the *inevitability* of such a regime as he pictures.

It is true that Americans have never produced a political theory of their own. But more often than not the theories from across the Atlantic which have "caught on" in this country have been the ones at first rejected in the old countries. The ideas of modern constitutionalism and representative government were first advanced by French and English philosophers, but they took root more rapidly in the new world than in the old. Like the immigrants who flocked here to escape one form of tyranny or another, liberal thought and practice in government often took root in North America much in advance of either England or the Continent. But the doctrines of tyranny have found tradition and custom more often with them in Europe than in America. That is one thing which I believe Mr Burnham has overlooked. In the stream of this country's future there will likely be two currents: the one from abroad, and the other out of our past. I hope it is not too much wishful thinking which impels me to say that I believe the author of this book has been so completely caught up in the former current that he scarcely realizes that the latter exists.

This is an important book. It is reported that the entire management of one of Chicago's leading firms, from the president down, has been reading it this summer. David Lilienthal says that it is "as full of unsupported assumptions as a country dog is full of burrs. But no administrator in public or private enterprise should fail to read it." This seems like a pretty fair endorsement, coming from one of those "exploiters" who has already taken his place in the front ranks of what Mr. Burnham calls the new aristocracy. If this does not impress you, the author will tell you himself how important it all is. If he does not convince you at once that what he has to say is the most important thing that has been (or is likely to be) written for a generation, then it is only because you are not sufficiently impressed with his pontifical manner of speaking.

John Day Larkin.

HELP! HELP! HELP!

(From page 32)

views, and many long distance calls had to be handled. One agency of the Government had the names and addresses of 156 alumni submitted from this office; another branch of the Government was supplied with names and qualifications of 57 of our men. In a word, the placement office teemed with activity for the whole year. Also, there was a great amount of time spent by the writer in visiting personnel officers in industrial areas, or in hotels when men from out of town, in Chicago for a limited time, were anxious to add to their personnel.

Our budget is rigid, our office force small (most of the time composed only of Mrs. Constance Carroll and the writer), and any extra work taxes our time heavily. This placement office belongs to our alumni and industry that hires them, and is absolutely free of charge to all. We always wish to do favors, but money and time spent to help a friend of yours, or a friend of a friend of yours, or alumni from other colleges, or casual readers of this column, places additional strain on our energy and budget. There was entirely too much of this sort of thing in helping others than our alumni during this past season, so please do not ask this office to help your non-Illinois Institute of Technology friends unless it is a case of dire necessity.

We want accurate records. Please help us to keep them. Send in your postal card or a letter, or telephone us when you are placed. This is the courteous thing to do. Don't cause us to write you, spend our money on sending you a wire, or take our time in making a telephone call, only to be told you have accepted a position two weeks before, and do not wish to use the services of the Placement Office at the present time. This lack of co-operation, courtesy and ordinary good business training on your part has caused unnecessary work in this office. We hope that in the future such oversight on the part of alumni with whom we work will be avoided. Furthermore, when we write you to give you a lead on a prospective job, please write him and us a courteous letter, whether or not you are interested.

Don't let our leads go unheeded. There is too much detail in this office for us to have to carry the entire responsibility. We need your help. This office frequently writes to an employer that he will hear from, say, five of our alumni. In many cases friendly employers never hear a word from one of them. This is not good manners on the part of the alumni to whom we have written. Bear in mind that this great demand for engineers is not going on indefinitely. The alumni who have cooperated, who have shown good manners and business sense in dealing with leads and their reaction to them are the ones who will have preference when jobs are scarce. Help us to retain our clients. Help us to make friends and keep them. Help us to keep the good will of your employers. Help us to make it more certain that you alumni will always be in demand, when times are good and when times are bad.

John J. Schommer,
Director of Placement.

THE NEW

TECHNOLOGY

CENTER

See

ANNOUNCEMENT

on

PAGE 62

CLASSIFIED ADVERTISEMENTS

THE AMERICAN RED CROSS ON THE CAMPUS

Last July many college students, temporarily deferred from selective service, were inducted into the Army. Arriving in camp they found trained Red Cross representatives there, not only to help with some of the many problems of their new life but, in case of need, to act as a link of communication with the folks back home. Those who fell ill undoubtedly were nursed by members of the Red Cross reserve, on duty for the emergency, and were provided with recreation and entertainment during convalescence by the Hospital and Recreation Corps, one of nine Red Cross special volunteer services.

The American Red Cross today is engaged in a vast program of preparedness for emergency. Through its 3,730 chapters and 6,585 branches, this program reaches every town, village and country cross-roads, bringing home to all the need and opportunity for individual preparedness and service under the Red Cross banner.

The aim of this program is twofold: prepare the individual for any possible emergency; strengthen weak spots in our social structure which experience abroad has shown will need strengthening, should a real crisis develop. Needless to say, college students, no less than others, are affected.

In some larger cities the Red Cross is engaged in a blood procurement project to create a 200,000-unit blood plasma bank for the Army and Navy. Plasma is that part of blood from which red and white cells are removed. It is an ideal substitute for whole blood in giving transfusions as it may be used without typing or cross-matching. Reduced to a dry, powdered form and vacuum-packed, it keeps indefinitely. Adding distilled water makes it ready for use. To speed the work the Red Cross is using mobile collecting units. One of these visited Princeton last May and had to stay over a day because of the many students who volunteered as donors. Among those donating blood to the cause has been Major E. E. "Swede" Larsen, football coach at the U. S. Naval Academy.

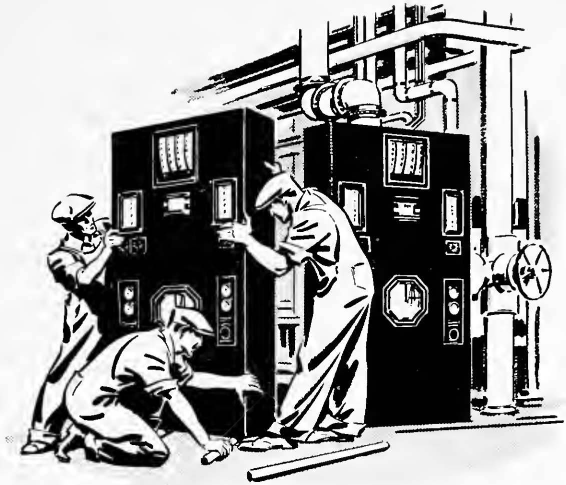
Most college students are familiar with the Red Cross water safety and life saving service. In the related field of first aid is another activity affecting the campus. Last spring local chapters were authorized to organize and train volunteer first aid detachments, composed of either men or women, wherever a need might exist. These are being set up in units of not less than 15 nor more than 50 members. They will be ready for instant action in any emergency. Not only are groups being organized in colleges, but in mills and factories, office buildings and apartments, and warehouse and dock areas.

Another Red Cross service is training of volunteer nurse's aides, open to women aged 18 to 50 years. At least 100,000 of these will be trained in 1942 in co-operation with the Office of Civilian Defense. Many trainees undoubtedly will be drawn from college women and alumnae all over the country. Upon completing 80 hours of intensive preparation, nurse's aides will assist, without remuneration, graduate nurses at hospitals, clinics and other health agencies.

Still other fields of service are open to college students. At present the Red Cross is creating special reserve units of medical technologists, laboratory and X-ray technicians, dental hygienists, occupational therapy aides and dietitians. Open to both men and women, these reserves are available to the Army and Navy, and also to the Red Cross in time of disaster.

In the various Red Cross projects college students have an excellent opportunity of taking an active, humanitarian part in these stirring times. By volunteering their services they will obtain training that may stand them in excellent stead at any unpredictable moment and will be performing a valuable and humane service to their fellow-men, their institution, their community and their nation.

With the exception of a few chapter areas where, for local reasons, the membership campaign is held at another time of year, the American Red Cross' annual Roll Call begins November 11 and continues through November 30. Dues collected at this time support all Red Cross activities and, excepting disasters or special emergencies, this is the only time that the Red Cross makes an appeal, either for members or funds. Because of the tremendous expansion of services this past year millions of new members are needed. Among these, the Red Cross ardently hopes, will be students from every campus the country over.



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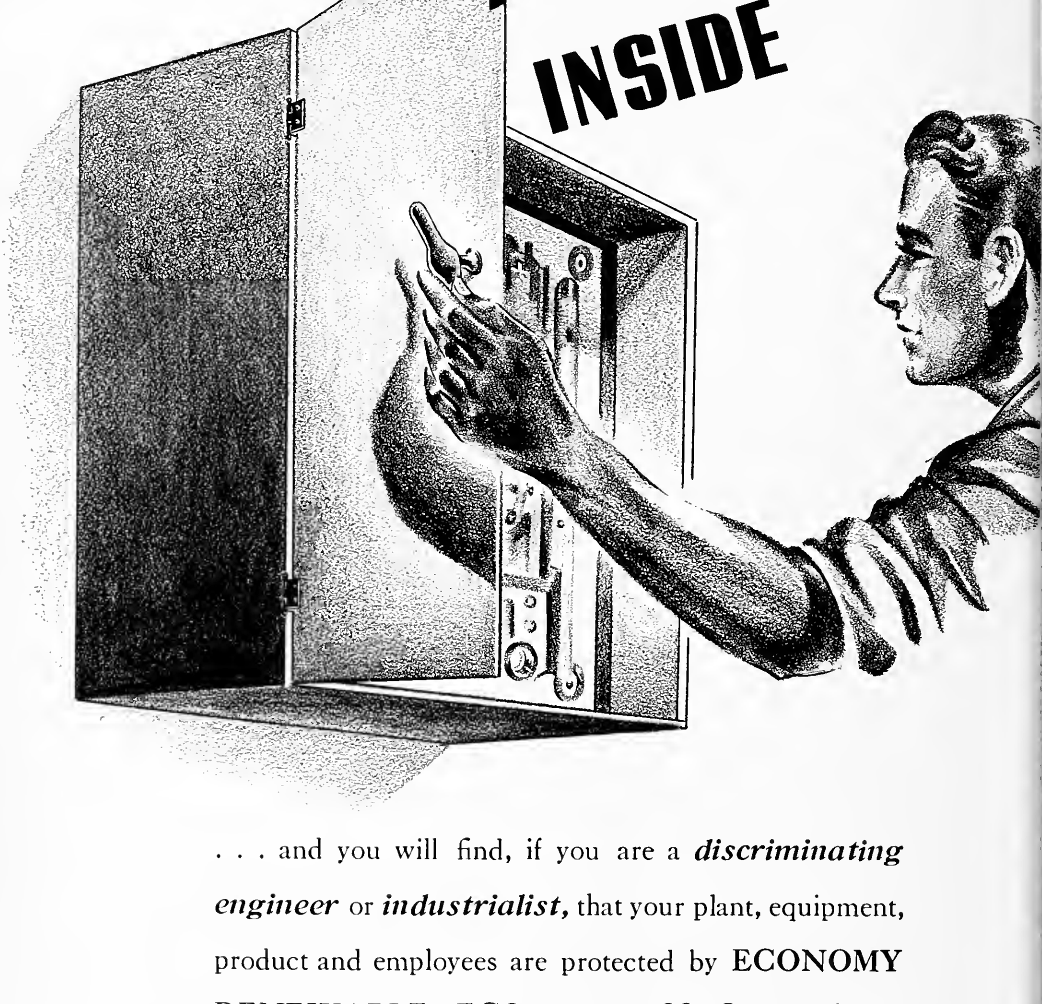


The New Technology Center

After this number of THE ILLINOIS TECH ENGINEER and ALUMNUS had been set in type, a meeting of the Institute's Special Gift Committee was held, and immediately thereafter the trustees authorized an announcement of such importance to our alumni and friends that we have deferred publication in order to include it. The text follows:

Trustees of Illinois Institute of Technology today announced first efforts to raise funds designed to equip a new physical plant for the school at an estimated cost of $3,100,000. According to Raymond J. Koch, as a result of only two week's work by the Special Gifts Committee of the Board, $500,000 in gifts has already been obtained for this purpose. Mr. Koch is chairman of the Special Gifts Committee and President of Felt & Tarrant Manufacturing Company.

The announcement of the work accomplished by the Special Gifts Committee was made today, Thursday, October 9 before approximately 100 civic and business leaders of the city at a luncheon in the Chicago Club. Today's meeting was the first report meeting of that special committee which began functioning officially two weeks ago.

Original plans for the development of "a great technological center" were first outlined last January by President Heald, James D. Cunningham, Chairman of the Board of Trustees and

President of Republic Flow Meters Company, and Wilfred Sykes, Chairman of the Trustees' policy committee and President of Inland Steel Company. The fund-raising program calculated to create in Chicago this great "technological center" is under the direction of Mr. Sykes, as chairman of the policy committee. Serving with Mr. Sykes on this committee are Mr. Cunningham, Mr. Heald, Charles S. Davis, President of Borg-Warner Corp., Sydney J. McAllister, chairman of the Board of the International Harvester Company, and Harris Perlstein, President of the Pabst Brewing Company.

According to announcement of the expansion program of Illinois Institute of Technology made last January, preliminary arrangements in the form of acquisition of six blocks of ground on the south side campus had already been made. This expansion is designed to provide adequate modern accommodations for some seven thousand students in engineering, arts and sciences and architecture. The end result of this program will equip a single campus for those enrolled in Armour College of Engineering, and Lewis Institute of Arts and Sciences, the two divisions of Illinois Institute of Technology.

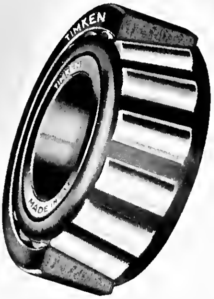
According to President Heald the gifts totalling $500,000 have been received from industry in the Chicago metropolitan area and are already in hand. Realization of the erection of Technology Center, announced in January as the name by which the new Illinois Tech campus with its $3,100,000 building program would be known, finds its first expression in the one-half million dollars in gifts, he added.

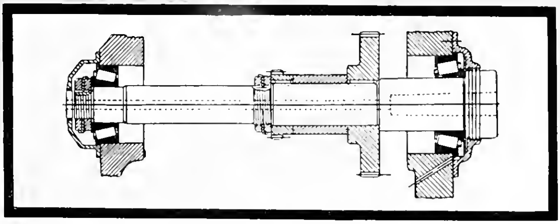
Architectural plans by Ludwig Mies van der Rohe, director of the Institute's architectural school, and Holabird & Root, Chicago architects, foreshadow Technology Center as the outstanding example of modern architecture in the United States. Architect van der Rohe's plans call for the completion of twelve buildings on the six blocks of ground acquired for this purpose. The area is bounded on the north by 32nd Street, on the south by 34th Street, on the east by State Street, and on the west by the New York Central-Rock Island tracks.

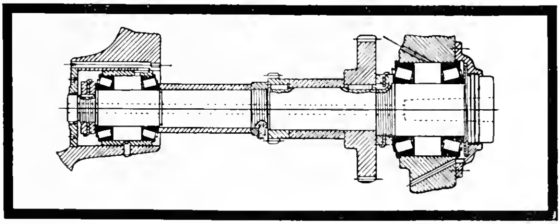
While the entire program contemplates progressive steps over a period of time, certain steps are outlined for completion during the coming few years. These include the erection of the following buildings: metallurgy, mechanical and chemical and electrical engineering buildings; a humanities building, and a library and administration building. No interruption in campus activities will be involved as existing facilities are and will continue to be utilized until replacement is complete.

Property supplementing the oldest portions of the former Armour Institute of Technology campus, now the south side campus of Illinois Institute of Technology, comprises the major footage on which "Technology Center" will arise. Additional property to make up the six blocks of territory which "Technology Center" will occupy was acquired during the two years preceding the building program and endowment fund drive announcement of last January.

What bearings would you specify for a Machine Tool Spindle?







Suppose you were designing a heavy-duty lathe for precision work—where tolerances as close as one ten-thousandth of an inch had to be held; where heavy cuts would be the rule. How would you mount the work spindle?

If you knew your bearings you would mount the spindle on TIMKEN Bearings front and rear. Then you would be assured of permanent spindle rigidity; freedom from chatter under any cutting load; any spindle speed; any rate of feed. In other words, *accuracy*. The spindle would turn smoothly because there would be no friction to hamper its movement. Power demands would be lower. Radial, thrust and combined loads would be carried safely under all operating conditions

By following the above procedure you would be doing what an overwhelming majority of the leading heavy-duty machine manufacturers have been doing for a long time.

If you would like to know more about the application of TIMKEN Bearings in all kinds of machine tools as well as in many other kinds of equipment write for a free copy of the Timken Reference Manual. Know your bearings—be a better engineer.

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Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

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At all the Games IT'S CHESTERFIELD

For **MILDNESS**, for **BETTER TASTE** and **COOLER SMOKING**, Chesterfield is the winning cigarette . . . they're quick to satisfy with their *right combination* of the world's best cigarette tobaccos.

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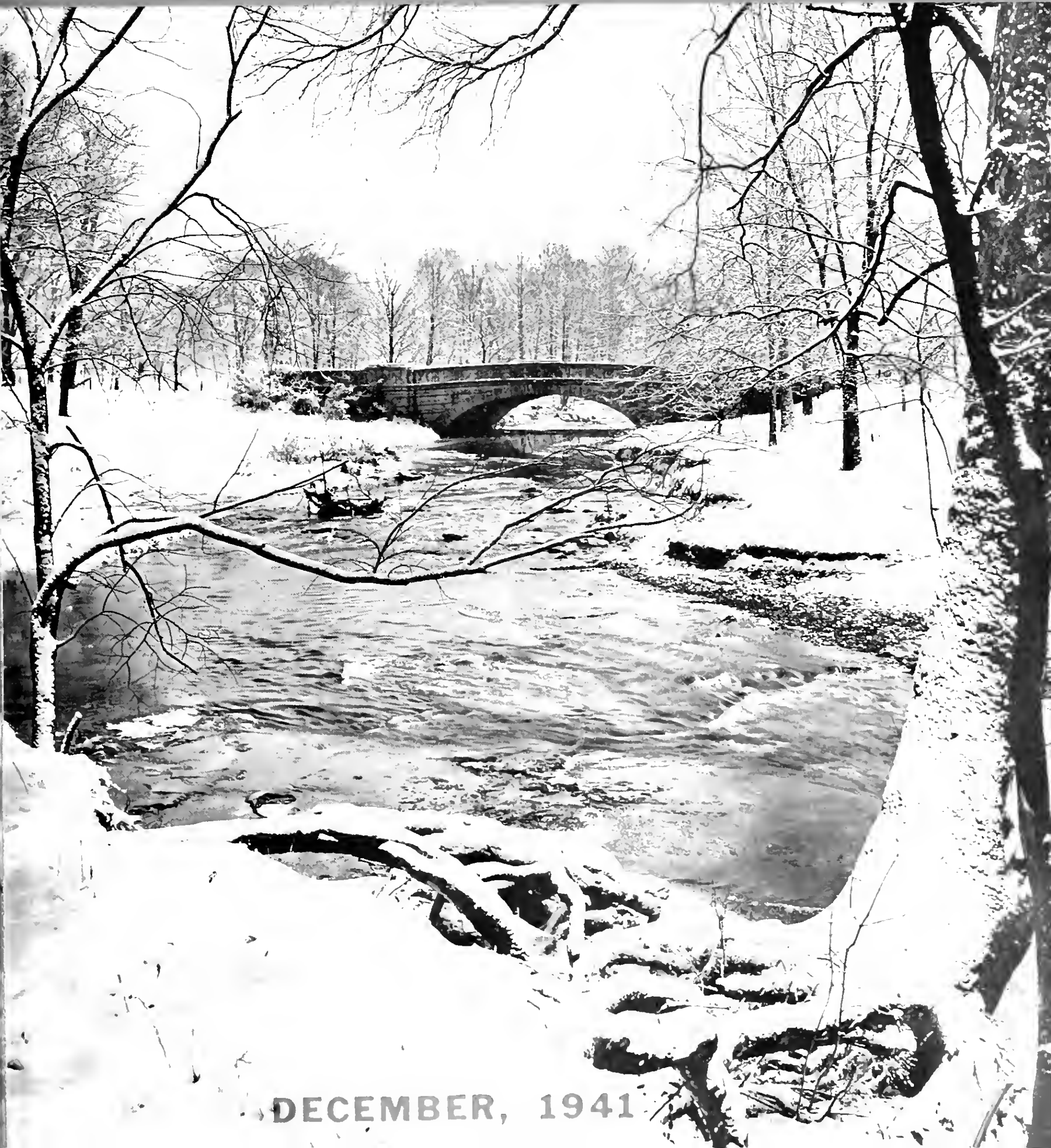
Everywhere you go . . .
it's have a Chesterfield *They Satisfy*

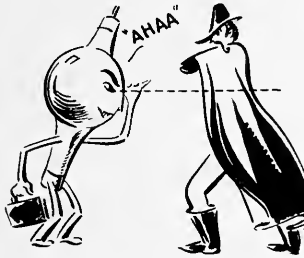
ILLINOIS TECH ENGINEER

AND ALUMNUS



DECEMBER, 1941

G-E Campus News

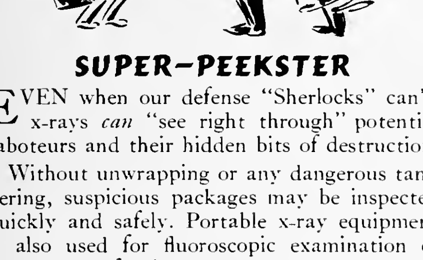


SUPER–PEEKSTER

EVEN when our defense "Sherlocks" can't, x-rays *can* "see right through" potential saboteurs and their hidden bits of destruction.

Without unwrapping or any dangerous tampering, suspicious packages may be inspected quickly and safely. Portable x-ray equipment is also used for fluoroscopic examination of overstuffed furniture, mattresses, or other articles in which questionable items might be hidden.

The x-ray has been instrumental in unearthing such things as a hypodermic needle and some narcotics cleverly hidden in a woman's handbag, a revolver baked in a loaf of bread, or hacksaw blades concealed in a cake of soap.



CURVES OF COLOR

THE most expert human eye can distinguish about 100,000 different colors, but that's practically color-blindness compared to the 2,000,000 that the G-E color analyzer can detect. The color analyzer can even measure your lady friend's blush, provided she holds it for two and a half minutes, and then, it will record it on paper for future reference!

The recording photoelectric spectrophotometer (that's the color analyzer's name) is only one of the things you can see in action in one of G.E's newest movies, "Curves of Color." This film, in full color, gives a 10-minute story of the world of color, telling why accurate color recognition is of such great importance to man and industry.

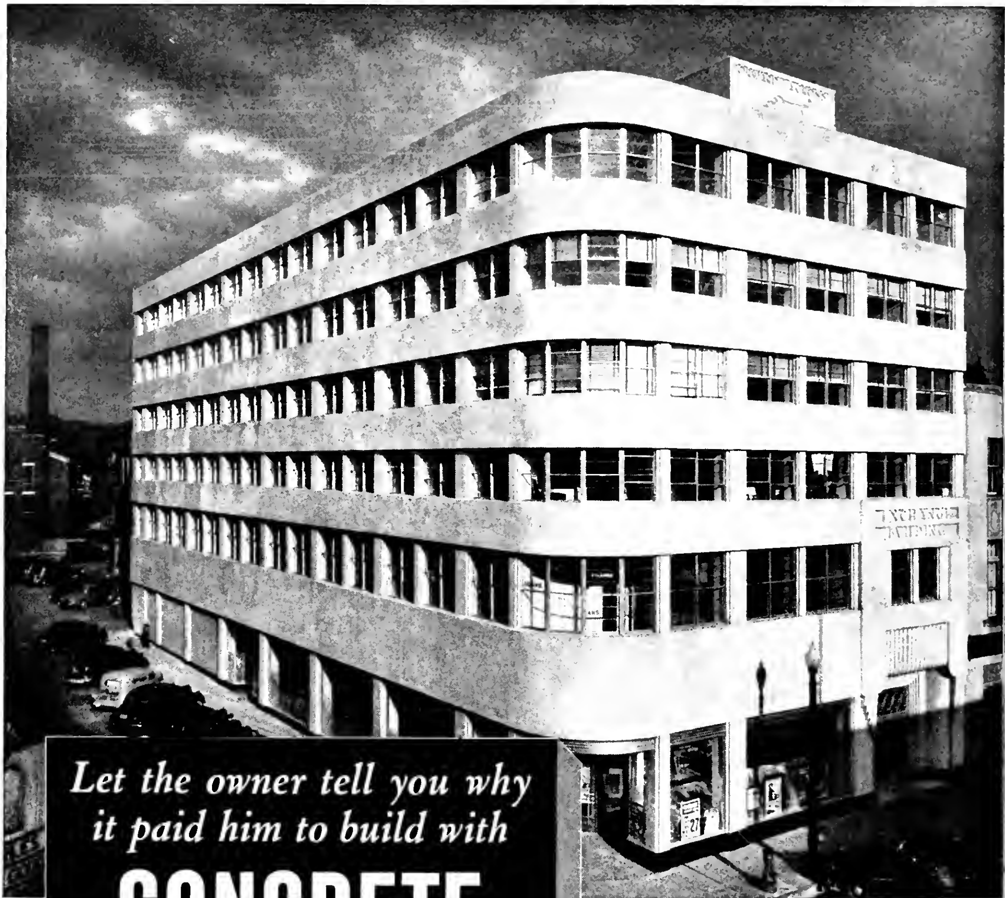
"Curves of Color" (16mm, sound) is purely educational and will gladly be lent to organized groups without any charge but the transportation costs. If you would like to show it at one of your dinners or club gatherings, just drop a line to Campus News, Dept. 318-6, General Electric Company, Schenectady, N. Y.

HOT DOGS AND COLD DIPS

THE strip mine of the Truax-Traer Coal Company in Fiatt, Illinois, hasn't actually been invaded by picnickers (yet) who want to cook hot dogs in the dipper of the big, 30-yard stripping shovel there, but it's an idea! Hot plates have been installed in the dipper, and Calrod heating elements have been put in the dipper handle.

The purpose of these heaters is not, however, to provide an extra service for possible picnickers, but to keep mud from freezing to the sides and bottom of the dipper. This used to reduce payload 50 per cent or more, and bonfires and a shutdown of 30 minutes to an hour were necessary to thaw out the frozen mass.

GENERAL ELECTRIC



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New Exchange Building in La Crosse, Wis., architectural concrete throughout, was constructed in temperatures as low as 19 degrees below zero. Designed by J. Mandar Matson, architect, of Racine and La Crosse, built by Standard Construction Co. of Minneapolis.

"The proper use of concrete in design and construction has produced an outstanding building at a cost of at least $35,000 less than it would have been had ordinary materials and procedures been used," says Dr. Frank J. Hoeschler, owner of this building.

"The insurance underwriters are giving the building the *lowest fire insurance rating in the city.*

"The building was 80% occupied before it was officially opened on June 14, 1941. Any future buildings I may undertake . . . will be architectural concrete."

Concrete is adaptable to any architectural style; helps achieve good appearance with very little ornament.

Construction is rapid, first cost is moderate and upkeep is very low with firesafe concrete construction. Ask your architect or engineer about the advantages of concrete for the industrial plant, the public or commercial building you may have in mind.

Write us for literature sent free on request in the U. S. or Canada. *See Sweet's Catalog, Section 4-49.*

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ARCHITECTURAL CONCRETE

Combining Architectural and Structural Functions in One Firesafe, Enduring Material

Contributors

John N. Becker, at the time when his article appearing in this issue was written, was chief control tower operator at the Chicago Municipal Airport. The article is in substance a reproduction of an address prepared by Mr. Becker for presentation at the Institute's first aeronautics conference, held October 30 and 31. Mr. Becker is a graduate of St. Lawrence College; he has taken additional courses at Teachers College, Oshkosh, Wisconsin, and at University of Chicago. He has been radio operator and purser in car-ferry service for the Pere Marquette Railroad; in statistical and engineering work for Western Electric; an instructor at Hawthorne evening school and at Crane Tech; and for eight years was in charge of the control tower at the airport. He is now airport inspector for the National Aeronautics Administration, and is stationed at Santa Monica, California. Besides his certificates in radio operation, Mr. Becker has instructor's rating in navigation and meteorology; he is a member of the American Meteorological Society, the National Aeronautics Association, and the Spread Eagle Club.

Billy E. Goetz is instructor in Economics at Illinois Institute of Technology.

A. W. Herrington, president and chief engineer of Marmon-Herrington Company, was born in England. He attended Stevens Preparatory School and Stevens Institute of Technology; served overseas in motor transport during the world war; has been consulting engineer on transportation problems for the Army and the Marine Corps; and has had extended experience in the design and manufacture of commercial motor cars, with several companies. In 1931, with the late W. C. Marmon, he founded the Marmon-Herrington Company, and he has been its president since 1932.

Sanford B. Meech is assistant professor of English at Illinois Institute of Technology.

Jean O. Reinecke is chief designer and member of the firm of Barnes and Reinecke, industrial designers. His early experience as art director of an advertising display company, and later as part owner of the company, led naturally to his present activities in design of products to the end that their appearance shall have esthetic appeal and functional validity. His firm has won some eleven awards for design.

John J. Schommer is well known to our alumni as professor of Industrial Engineering, director of Physical Education, and director of Placement. The subject of his article in this issue makes it pertinent to add that he is also assistant to the state adviser on occupational deferments, Cook County Appeal Board District, Selective Service.

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AIRPORT TRAFFIC CONTROL

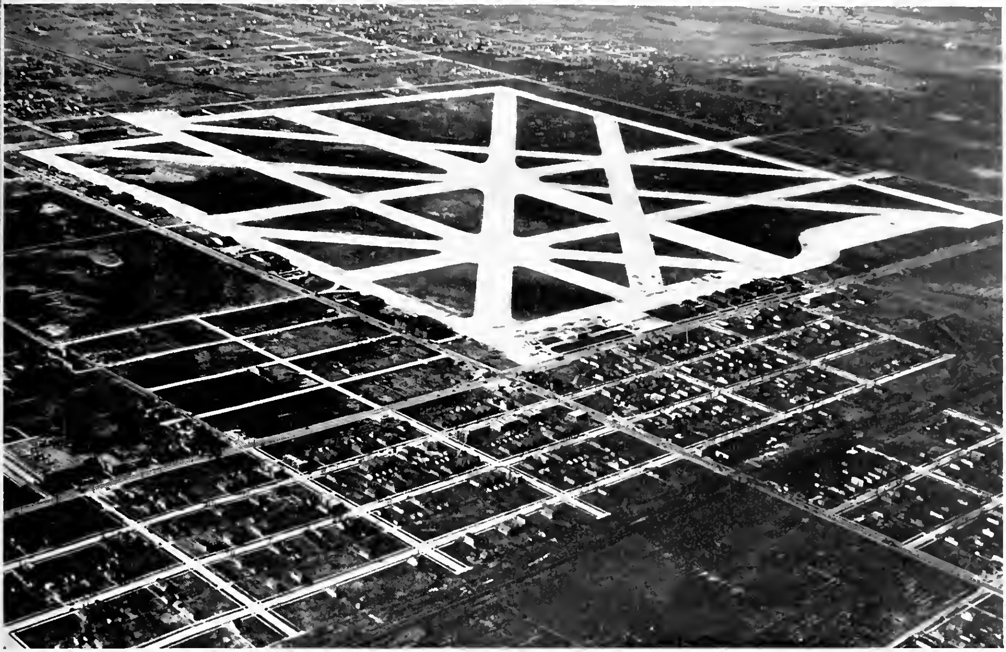
By

JOHN N. BECKER

Psychologists tell us that the human mind in many ways is not so readily adaptable to varying situations as the animal mind. If a human being travels at a speed greater than five miles per hour there is danger of collision and interference from others in the vicinity. Birds and animals frequently move in large groups up to twenty and thirty miles per hour with ease and precision. Observing a flock of pigeons or sparrows in flight confirms this. A shortcoming in the human mind necessitates the traffic control required for automobiles with which we are all thoroughly familiar. Automobiles travel at twenty-five miles or more per hour in congested city traffic; airplanes must travel at much greater speeds with consequently closer traffic con-

Operator on Duty in Control Tower
Chicago Municipal Airport

United Air Lines Photos by Grignon



Chicago Municipal Airport

trol. To most of us this system of airplane traffic control is incomprehensible, as we have not become involved in it personally and, consequently, do not understand its rules, the equipment involved or the methods employed by those concerned with its observance.

The fundamental rules and equipment of automobile traffic control are also utilized in aircraft control. The red and green lights have identical significance. A green light means "proceed"—a red light means "stop." An airplane flies on the right side of its course on an airway, and traffic officers are in charge to direct traffic.

Here the similarity stops, on account of the speed necessary, and because three-dimensional movements are required, while automobile traffic is confined to two dimensions. The slowest airplanes move at speeds down to a hundred miles per hour, while the fastest ones travel up to two hundred and fifty miles per hour and, consequently, special means of control and special rules are necessary. The highways of the air are termed airways and are officially designated by the Civil Aeronautics Administration. They run between airports, start five hundred feet above the surface of the earth, and extend up to the highest altitude that aircraft can fly. These airways are marked by lights on the ground and also by radio beams. Radio markers indicate turns in an airway and also the distance to an airport, conveying information to the pilot somewhat like that furnished by the markers along highways. A pilot flies on the right side of an airway and is guided by the radio beam; somewhat like a motorist who is required to stay on the right side of the white line on the highway. A rule to separate traffic, in addition to flying on the right side, is that all flights toward the easterly half of the compass use odd altitudes (expressed in thousands), while those toward the westerly half of the compass use even altitudes. These simple rules would probably be sufficient were there only a few airplanes. Last year, however, 90,000 airplanes arrived at and departed from the Chicago Municipal Airport alone. This figure does not include the large number of flights which took place at the smaller airports in the vicinity. To handle such large numbers safely, two organizations have been set up; one is under airport supervision and is called an airport control tower system; the other is under government control and is called airways traffic control. Each organization is distinct from the other, but close cooperation is maintained.

Instructions from these organizations are issued to the pilot, according to the equipment in the individual airplane. Some private pilots have no radio, and lights are employed while those with radio equipment converse by voice directly. At the airports where the airways converge the traffic is most congested, as at busy corners on our highways. The airport control has jurisdiction in the immediate vicinity and assigns altitudes and positions in traffic. The

Above: Servicing Planes. Control Tower in Background.

Below: Mainliners on the Line.

pilot, on approaching an airport, reports his position and altitude when approximately twenty-five miles distant. He is informed about traffic in his vicinity, both departing and arriving, and is assigned his sequence in the inbound traffic. He is also given the wind velocity and direction, his runway and the direction of landing. As he proceeds to the field, he is assigned new positions as necessary on account the traffic converging from other directions, until his time of landing arrives, when he is cleared to land on a runway designated. The private pilot, without a radio, is the most difficult to control, as the only means available for communicating with him is by lights. It is fortunate that the Civil Aeronautics Administration has provided for traffic of this type by limiting flights in accordance with the limits of pilots' licenses and to certain weather conditions.

To the uninitiated, this movement of aircraft is bewildering. Possibly a dozen aircraft are proceeding to the airport at one hundred and fifty to two hundred and fifty miles per hour, and a similar number are leaving, while at the same time more are being fed into the area by the government-controlled Airways Traffic Control, who have charge of the traffic away from the airports and at the airports under certain weather conditions. All the airplane movements must be handled without delay and all must fit smoothly into the pattern, as no airplane can stop in mid-air to wait for another to pass.

To provide such precision, specially designed radio equipment is required and highly trained men are necessary. A recent installation in one of these airport control units required an outlay of $50,000, which gives some idea of the complexity and preciseness of the equipment. The receivers are all fixed-tuned to a certain frequency from which they must not deviate. Their sensitivity must exceed that of the best home radios, as they must receive from low-powered transmitters even under adverse conditions. Here in Chicago we have fourteen such receivers. This large number is required in order to receive from pilots flying for the eight airlines using Chicago as a base, as well as from itinerants, army pilots and others who use special frequencies. There must also be extremely reliable transmitters which operate on 278 kilocycles and which must not fail under any circumstances.

The power supplied to the receivers and transmitters must never be interrupted. In addition to the regular power mains, an auxiliary main is constantly available, which is automatically connected in the event the main power line fails. Should both supplies fail, there is still another which originates in a local generator driven by a gasoline engine. In addition to the radio equipment, there is an anemometer, which indicates wind velocity, and a wind-direction indicator. These are constant-reading instruments which are needed to indicate the direction of take-off or landing. Private line telephones are provided for instantaneous communication with Airways Traffic Control, with the eight airlines, and with the government range station and Weather Bureau.

Another extremely interesting and valuable piece of equipment used at some airports is the automatic recorder. This machine is a special phonograph recorder, designed to record the receptions from all the receivers and transmitters in the control station. In other words, everything said by the operator over his transmitter and everything received from the pilots is permanently recorded. The records run for one and one-half hours on each side, in order to reduce the number of interruptions. This machine has many advantages, one of which is that it replaces the written radio log, which is usually too brief to give anything resembling a complete picture. It also settles any arguments as to what instructions were given and acknowledged. Above all, the main advantage in its use is that both operators and pilots use extreme caution in giving and acknowledging instructions; this is absolutely essential, as anything other than the correct information may jeopardize safety and life. It has proven the greatest incentive to date in improving and holding the high standard required of the operators at our airport. It is interesting to note that every word said by the operator over the radio, and everything received by radio from the pilots, since the installation of the recorder a year ago, is on record and can be transcribed at will. Possibly at some future date, equipment of this type may have a wider usage and may be installed in banks, courts, police stations, and other institutions where a record for future reference is required.

There will soon be a new lighting system on the airport, also under the airport control station, which will, in addition to lighting the airport boundaries and hazards, provide lighting for all runways. There are duplex runways permitting landings and take-offs to eight points of the compass. When a green arrow is lit at a runway entrance it indicates that it is the landing runway. A red arrow at the entrance indicates a take-off runway. The runways to the four cardinal directions are approximately a mile in length, while those diagonally between these directions are approximately a mile and a third in length. Flood lights, located at the four corners of the airport, will also illuminate the airport for landings at night. A novel feature of our present installation is the runway numbering, based on compass bearings, and marked off in three hundred and sixty degrees of the circle. Entrances are so marked that if a pilot is told to land on runway nine he knows that his compass must read ninety when landing and, accordingly, if he lands on runway thirty-six, his compass reads three hundred and sixty, and so on.

Complete familiarity with all this equipment is required of the operator who controls the traffic. Long experience and a number of government certificates are necessary before he is permitted to direct pilots in traffic. The United States Government, very wisely, requires two licenses and a special rating before an operator is permitted to assume his duties. This assures the handling of traffic by competent operators. The first requirement is a third-class radio license. However, in Chicago the airport specifies a still higher radio license, either second or first, which are the highest obtainable; the examinations require at least two days to complete. The other government requirement is a control-tower operators' certificate and is classed with the highest airmen's certificates. The questions for the examination for this certificate cover the best methods for handling traffic both from control towers and on the airways; the laws of flight, as specified by the Civil Aeronautics Authority; meteorological conditions; navigation of aircraft; and the radio ranges and markers within two hundred miles. In addition the operator must know the airports in the vicinity, the obstructions and their height, and the detailed geographical location of all important positions.

The physical requirements are also high, being similar to those for pilots. In order to insure his remaining physically qualified, an examination by a government designated physician is required before the issuing and yearly renewal of the operator's certificate. Particular attention is given to the eyes and ears. In addition to the usual examination to determine eye

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RESEARCH IN THE DEPARTMENT OF MECHANICAL ENGINEERING

By
JOHN I. YELLOTT

A committee of the American Society of Mechanical Engineers has recently submitted the following definition:

> Mechanical engineering comprises the art and science of power generation, the transmission of power, and transportation by mechanical devices; of the production of machinery, tools, and their utilization; it includes research, design, development, application, and the management functions of organization, operation, maintenance, and marketing.

In order to deal successfully with the technical problems which arise in such a wide range of subjects, the research engineer should have at his disposal all available knowledge in the fields of heat, materials, and mechanics. He should have a reading acquaintance with several foreign languages, so that he can make a thorough search of existing literature. In addition, he must have a sufficient command of mathematics to enable him to formulate equations to cover his particular problems and to obtain useful solutions to his equations. He must be able to devise and perform experiments by which his results can be tested without excessive expense. If his experiments are successful, he must then be prepared to sell his ideas to his superiors, and to engage in the activities which are mentioned in the last clause of the definition. If his experiments are unsuccessful, he must have the patience and resourcefulness which will enable him to continue until the correct solution is found.

An engineer who possessed all these characteristics would indeed be a paragon. It is highly unusual to find one man who is a master of both the analytical and the experimental methods of attack. The day has long since passed when one might successfully take all knowledge for his province. Today, there must be specialization as to the field of investigation, and further specialization as to what particular corner of that field shall be cultivated intensely.

Industrial research is usually restricted to the immediate problems of a particular company, and extension of the field of human knowledge is not the primary objective. There are notable exceptions to this statement, and some extremely valuable discoveries have been made in the course of work which was intended primarily to throw light upon an obscure subject. In the main, however, industrial research is initiated to find a commercially acceptable answer to a currently pressing problem, and the results are usually retained until all possible advantage has been gained from them. Publication of such results for the advancement of human knowledge is generally delayed, thus retarding the development of the art as a whole.

Institutional research on the other hand, is undertaken primarily for the purpose of expanding knowledge, and early publication of significant findings is encouraged. The projects which are undertaken in a particular institution depend, of course, upon the talents of the individual members of the staff. In general, it may be said that these projects are of three types. The first type includes purely scientific investigation of some phase of knowledge which is found to be neglected, or which has been revealed but passed over by some earlier worker. Such work is valuable because it usually leads to results which, when they become widely known, are useful in the solution of more pressing problems.

The second type includes the study of problems which have been encountered in industry, but which industrial research has, for one of many valid reasons, passed by. Competitive industry must often be content with a partial or incomplete answer, when the really interesting phases of the problem lie still further along the way. Industry, also, is frequently content with an empirical answer to a problem for which an analytical solution requires only more time and study.

The third type covers research and development which is carried out by a faculty member for a private industry, which lacks the equipment and scientific talent to attack the problem in its own plant. Work of this nature is carried on most effectively at Illinois Institute of Technology by the Armour Research Foundation, and members of the Department of Mechanical Engineering are currently engaged in many such projects. They are valuable to the sponsoring company because the company is thus able to enlist the services of exceptionally able individuals; they are beneficial to the faculty member who participates since they bring him into close contact with industry.

The research problems which are sponsored by the Mechanical Engineering Department are all of the first two varieties. They are undertaken to extend the field of scientific knowledge, they arise from the ex-

perience of faculty members in advanced study or in industry, and they provide valuable opportunity for graduate students to enter the field of research. Currently, work is being done in applied mechanics and machine design, in heat transfer and thermodynamics, and in applied fluid mechanics. The impact of the defense training program has been felt severely by the Department, and much work which would otherwise have been undertaken has necessarily been postponed because of inability to obtain time and equipment. Despite these difficulties, work is going ahead, and some of the more interesting projects will be mentioned.

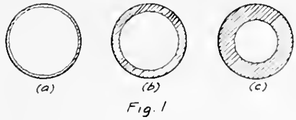
In the field of applied mechanics and machine design, Doctors L. H. Donnell and N. O. Myklestad have been engaged in applying advanced mathematical techniques to the solution of general problems of stresses in solids, plates, and machine elements. In Dr. Myklestad's latest paper,[1] recent developments in the integration of the thermo-elastic equations are applied to the determination of stresses in infinite solids within which are included ellipsoids or cylinders at a higher temperature than the surrounding solid. To reduce this concept to practical usefulness, it is shown that if the minimum dimension of the solid is three times as great as the maximum dimension of the inclusion, the solid may be considered infinite.

Much of Dr. Donnell's work has been directed towards increasing the exactness with which certain complex problems in machine design can be treated. In his contribution[2] to the von Karman Anniversary Volume, Dr. Donnell treated mathematically the subject of stress concentrations in reinforced plates. While the treatment is exact only for elliptical discontinuities in infinite plates, it is shown that the approximation is good whenever the plate is large compared to the discontinuity. Practical applications of this treatment are found in bosses on thin castings, the bases of winches or other auxiliary equipment such as guns which are attached to the deck plating of ships, etc.

From his experience with the Goodyear-Zeppelin Corporation, Dr. Donnell[3] and two former colleagues have derived general solutions for the stresses in rings which are stiffened by radial spokes.

In a paper[4] prepared for presentation at the 1941 annual meeting of the A.S.M.E. in New York, Dr. Donnell has given an explanation of the peculiar manner in which materials fail after plastic flow has set in. Taking as his example the twisting of a circular bar, it is shown that, as the bar is twisted beyond the yield point, the yielded material should form smooth and annular regions, which should be, successively, as indicated in Fig. 1, (a), (b), and (c). Actually, experiments show that the yielding is concentrated in radial wedge-shaped regions, distributed in a remarkably uniform manner about the circumference. They are quite slender, but increase in width as they grow in length, as indicated in Fig. 2, (a), (b) and (c), which shows typical successive stages of the process. A logical and satisfactory explanation for this peculiarity is found to arise from the discontinuous behavior of the material around the yield point.

Proceeding naturally from his interest in stress and strain is a new and supersensitive dial gage which Dr. Donnell has recently patented. In this instrument, a very light hand is mounted on a shaft of very small diameter (about 0.004 inch), which is both supported and rotated by three sectors. These sectors are pressed against the shaft as shown in Fig. 3, and there are no other bearings. Friction, inertia, and lost motion at the high-speed end are reduced to a minimum, and consequently a magnification of about 2500 to 1 is feasible in an instrument which is only one inch square.



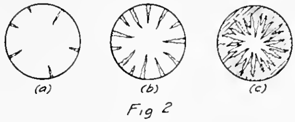
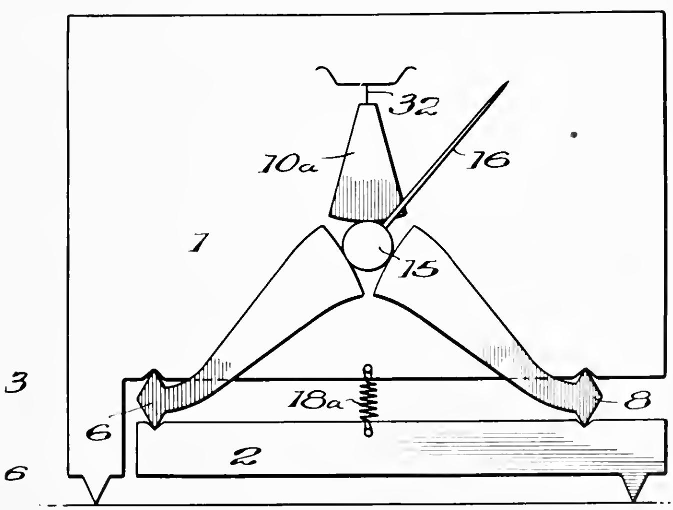


Fig. 1. Manner in which a twisted rod should fail.

Fig. 3. Manner in which a twisted rod actually fails.

Fig. 3. Ultra-sensitive strain gage, invented by Doctor Donnell.



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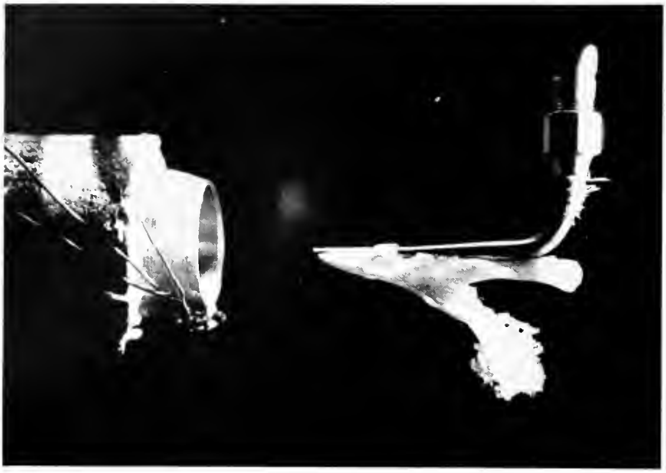

Fig. 4. Ice forming on a steam nozzle.

Fig. 5. Ice forming a "frozen shock wave" on a search tube. Steam pressure 0.025 pounds per square inch absolute.

In the field of heat transfer and applied thermodynamics, Dr. Max Jakob has continued the distinguished work which has brought him world-wide recognition. His recent experiments, conducted with Kenneth Rees, have resulted in a general theory of heat transfer to and from fluids in laminar flow through an annular space.[5] Dr. Jakob is also carrying on work in the boiling of fluids in vertical tubes with free and forced convection, which will have direct application in steam generating equipment. In a different but related field, Dr. Jakob has also been studying the true temperature of a catalyst in experiments with nickel black and the hydrogenation of ethylene into ethane.

Since heat transfer in forced convection is closely related to the velocity distribution in the flowing fluids, Dr. Jakob has also been interested in equations for determining velocity as a function of pipe radius. In a recent publication,[6] it is shown that, over a wide range of Reynolds numbers the average velocity occurs at a constant distance from the pipe wall; when this distance is expressed as a fraction of the pipe radius, the ratio is 0.23 ± 0.01. Going further afield into the realm of applied fluid mechanics, Dr. Jakob is studying with A. L. Winkler the pressure distribution in butterfly valves.

The behavior of steam as it flows at high velocity through pipes and nozzles has been the principal research interest of the writer. Since he found as a graduate student in 1931 that steam flow could be made visible because of the moisture drops which form during condensation, he has been applying this technique in the study of steam flow problems. Most of this work has been done at velocities above the acoustic, a condition which is of primary interest to steam turbine designers and to those who deal with exterior ballistics. It has been found possible to observe the flow of steam over an air-foil, and to see that slight changes in angle of attack may produce drastic changes in lift.

Particular problems which are now being studied include the behavior of Venturi nozzles with variable angle of divergence. It has been found that the rate of expansion plays a very important part in the condensation of flowing steam,[7] and the present experiments are being carried out with the intention of completing the writer's earlier work on super-saturation.

The Worthington Pump and Machinery Corporation has recently made available to the Mechanical Engineering Department a very complete apparatus for studying the behavior of nozzles which discharge into a region of very low pressure. This equipment consists of a four-stage steam jet ejector, with a surface type intercondenser, which can produce pressures well below the ice point. The efficiency of nozzles, and the manner in which steam expands at very large pressure ratios, will be the first subjects to be studied. This apparatus can produce the spectacular phenomenon of ice forming on a nozzle, less than six inches from the inlet which may be at 350° F. Figure 4 shows a nozzle operating under this condition.

It has been aptly remarked that "Research begets research," and the writer's steam experience has borne

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SHIPBUILDING ON THE GREAT LAKES

Those of us who enjoy voyages on steamships on the Great Lakes have noticed how often the lettering on the capstan, indicating the name and location of the builder, includes the interesting old Indian word, Manitowoc. It suggests birch-bark canoes, portages, the days of the explorers and pioneer settlers. On modern craft, the old name sets one to thinking about the little Wisconsin city, and wondering how long a time has passed since it first sent out ships to sail the lakes.

More than a hundred years ago, in 1836 to be exact, Captain J. V. Edwards of New Jersey settled at Manitowoc Rapids. It was he who built the first scows to transport lumber from the Rapids into the so-called Manitowoc Bay; there the cargo was loaded on sailing vessels.

There was considerable early activity in shipbuilding circles in Manitowoc. From the year 1847 to 1900 there were about 110 schooners built here; there were also some forty steamers and forty-one tugs and barges. Shipbuilding was not confined to Manitowoc; schooners were built also at Neshoto and Two Rivers.

Early shipbuilding in Manitowoc, appropriately called "The Clipper City," was confined to wood construction; in fact the building of steel vessels did not begin until 1902. At that time the local shipbuilding plant consisted mainly of a small graving dry-dock, a plate shop, storeroom and wood-working shop. Shortly after 1902 the shipbuilding industry in this city turned to steel construction and during a few years the change was made gradually; today all new construction is of steel. Now the shipyards occupy a territory of thirty-five acres located on a peninsula having about 4500 feet of navigable dock frontage and equipped with modern machinery in all of their various departments. The shipbuilding company designs and builds not only its own hulls, but engines, boilers and

Glander Art Studio, Manitowoc

miscellaneous ship auxiliary equipment that is necessary to complete a vessel and have it ready for operation.

Since 1902 there have been about 300 additional hulls built in Manitowoc, including steel passenger and freight vessels, car ferries, car floats, lighters, self-unloaders, tankers, dump-scows, dredges, fire boats and tugs.

In addition to its shipbuilding activities, Manitowoc Shipbuilding Company has a department known as Manitowoc Engineering Works. Under this latter departmental name the company designs and builds paper-mill machinery, cement-mill equipment, and Speedcranes and Speedshovels; it also does heavy plate fabrication work.

Another department, Manitowoc Boiler Works, is concerned with designing and building marine boilers, heavy pressure and storage tanks, stacks, etc.

The development of the shipbuilding industry here, which made it possible to deliver thirty-five ocean-going cargo vessels to the United States Emergency Fleet Corporation during the world war, has given Manitowoc a modern and up-to-date shipbuilding plant.

In addition to the new construction, many passenger and freight vessels have been completely rebuilt and the company has handled a large amount of ship repair work through its drydock facilities, which enable it to dock vessels up to 600 feet in length.

ANNUAL CONFERENCE ON AERONAUTICS

Illinois Institute of Technology held the first of its series of fall engineering conferences October 30 and 31, 1941, at the Palmer House, Chicago. The subject was AIRPORTS.

In planning this series it was the intention to vary the subject from year to year, choosing any topic within the field of interest of a college of engineering, except POWER, which is discussed in the Midwest Power Conference held annually in April under the sponsorship of the Institute, in association with other colleges and universities, and with engineering societies.

During the Airport Conference, and after its conclusion, in compliance with requests for recommendations regarding subjects for future conferences, suggestions have been received from representatives of the air lines, from members of the staff of the Civil Aeronautics Administration, from officers of state and city organizations, from representatives of industries concerned with aviation, and from others who attended the Conference.

There is definite agreement on the desirability of an annual meeting to discuss aeronautics. The increasing importance of aviation is obvious. For geographical and other reasons the Institute is well situated to be helpful in the evolution of the most modern form of transportation.

The AIRPORT CONFERENCE of 1941 has become the FIRST ANNUAL CONFERENCE ON AERONAUTICS, and the beginning of a series to be conducted regularly in October, under the sponsorship of Illinois Institute of Technology. The tentative dates for the 1942 Conference are October 29 and 30. Inquiries about the Conference, and suggestions for the program, may be addressed to J. B. Finnegan, Conference Director, or C. O. Harris, Conference Secretary, Illinois Institute of Technology, 3300 Federal Street, Chicago.

E. S. M. D. T. AT I. I. T.

Initials for government agencies and their activities have become a regular part of the national life. In much the same manner, and for nearly the same reasons, the initials which form the title of this report have become a part of the normal activities of Illinois Institute of Technology. The beginning of college-level defense training at Illinois Institute of Technology was related in the March, 1941, issue of the Engineer and Alumnus, and subsequent developments have been described in later issues. The current status of the Institute's defense training activity is the subject of the present report.

As a consequence of the nation-wide success which greeted the establishment last year of E. D. T. (Engineering Defense Training), the national advisory committee decided to extend the college-level training program to include work in physics, chemistry, and production management. Accordingly, the name of the program was changed to indicate the broadened scope, and it is now, officially, "Engineering, Science, and Management Defense Training."

The Defense Training Committee of the Institute, charged with the responsibility of finding and meeting needs for college-level training, found that its first task for this academic year involved the training of prospective Ordnance Inspectors. At a conference with civil service officials and representatives of the Chicago Ordnance District, it was learned that more than four hundred junior inspectors were needed, while the civil service lists were empty of qualified applicants. Accordingly, it was decided that an intensive full-time training course should be established, similar in content and arrangement to the summer's Production Inspection course. After conferring with Major E. P. Reed and R. A. Dombrow, E. E., 1933, of the Chicago Ordnance District, a curriculum was set up which met the requirements of both Ordnance and Civil Service.

The engineering building of the Lewis Institute division was taken over for the program, and Professor J. C. Kozacka was designated as the resident faculty member in educational charge of the course. Instructors were recruited from the summer teaching staff, from the vocational program which was discontinued when the summer course was begun, and from industries which were willing to release men on leave of absence. Among the I.I.T. Alumni in the program are E. A. Crouse, M.E.,'41; A. R. George, M.E.,'40; Leon Rottman, Lewis, '41; Walter Jordan, M.E.,'42; C. A. Turner, Lewis, M.E.,'41; and Louis Pennisi, Lewis, '40. W. O. Anthony, M.E.,'41, joined the staff as an instructor in materials, and was promoted to Administrative Assistant when R. M. Van Valkenburgh, who held this post during the summer, was called to active service and assigned to the Army Industrial College.

The ordnance inspection curriculum includes such subjects as applied mathematics, strength of materials and materials laboratory, metallurgy and metallography, production methods and shop practice, and industrial inspection. The latter course is supplemented by six hours of inspection laboratory per week, during which the student will become familiar not only with all types of gages and measuring instruments but also with magna-flux inspection methods. In addition, the fundamentals of X-ray inspection will be explained by Dr. Otto Zmeskal, using new X-ray facilities which are being installed in Machinery Hall on the Armour Campus.

One of the most useful subjects in the course is Ordnance Regulations, in which the prospective inspectors will become familiar with the paper work which must be mastered by all new inspectors.

The students, or trainees, for this program were enlisted by the usual publicity methods. Newspapers, radio, and direct mail drew a continuous stream of applicants, who were interviewed by the instructors, and passed upon by the Defense Training Committee. For the first time in the Institute's defense training experience, aptitude tests were employed, and it was found that those who had been tentatively accepted were, in general, far above the average in these tests. The validity of the tests will be checked by studying the scholastic performance of the students.

The ordnance inspection course began on Monday, September 27, and the first two hundred men will have completed the course by January 5, 1942. Plans are now being laid to enroll a new group of the same size, to start on January 16. The requirements for admission and other information can be obtained from the Defense Training Office at Lewis Institute.

The evening E.D.T. work which drew some four thousand part-time students to the Institute last year was so successful that a similar large scale program was set up in October under E.S.M.D.T. Thirty-nine courses were offered, and the response was so great that 120 sections were opened. Every available classroom, which the regular evening school had not pre-empted, was seized upon, and filled with E.S.M.D.T. classes. More than 3000 individuals were enrolled, and some sections were again established in Waukegan, Joliet, and in the Loop.

The subjects offered in this, the sixth defense training program, were similar in nature to those given in the first and second evening programs. The program is much stronger in the field of electrical engineering, thanks to the energetic cooperation of Dr. Jesse Hobson, the newly appointed director of that department. Dr. Hobson's course in Power System Engineering Problems, given in the Civic Opera building, has attracted an attendance of seventy-five graduate electrical engineers. Classes in inspection methods, time and motion study, production methods, and industrial management for foremen have proven to be most popular. Twenty-two sections of the latter course have been organized, of which eight are operating directly in defense plants.

The success of earlier E.D.T. courses was due to the ability of the instructors, virtually all of whom came from industry. Most of these men are again instructing this year, and their experience enabled the pro-

gram to get under way with a minimum of confusion. Regular faculty members are given the responsibility of supervising the courses and assisting the instructors in every possible way. Dean F. A. Rogers is the director of E.S.M.D.T., ably assisted by W. O. Anthony. The secretarial staff, under the direction of Miss Aline Neymark, now consists of eight full-time girls, who are kept busy preparing the steady stream of reports, mimeographed material, and more reports, which flow from the three E.S.M.D.T. offices.

Future plans are necessarily uncertain. One course which will be offered under unusual circumstances will be that in Microwave Techniques, to be given to senior E. E.'s during the second semester. College credit will be given for this work, although for no other E.D.T. or E.S.M.D.T. course is such credit awarded. The work in Microwave Techniques will be under the direction of Dr. Robert Sarbacher, who attended an intensive three-weeks preparatory course in this subject at Massachusetts Institute of Technology. An entirely new ultra-high-frequency laboratory must be set up for this course, and most of the equipment will have to be built by the electrical engineering department, since such apparatus is not yet in commercial production. Students who complete the course will be under no obligation to join the Signal Corps, and, since the number of such specialists is very small, their services will be in great demand.

Another rather unusual program is the projected course in Industrial Safety Engineering. In this course it is hoped to enroll some eighteen hundred men from supervisory ranks in industry who will be able to promote safety in their own plants. The instructors will all be practical industrial safety men, and their course has been carefully prepared by experts of the Labor Standards Division, U. S. Department of Labor. Since most of these prospective instructors have never taught before, they will be given intensive training in the art of teaching. They will also meet in conference groups before the course begins so that they can study their instructional material together and thus each man will give the same course.

This program will start in January and will run for sixteen weeks, with two evening meetings each week. Sixty sections are contemplated at present, and the cooperation of the Chicago School Board has been assured; the classes will be held in public school buildings in various parts of the city, so that neither instructors nor students will have to travel too far to attend.

A new responsibility has been handed to the Defense Training Committee by the Training Within Industry division of O. P. M., which has recently initiated a highly effective streamlined type of training for industry, known as J. I. T. These initials mean Job Instructor Training, by which supervisors, foremen, and others in industry who have to teach operators how to do their jobs, are taught how to teach more effectively. The J. I. T. trainers are men from the training divisions of large companies who have themselves undergone an intensive course in how to train trainers. These trainers are now available for assignment to defense plants, where they will put on a ten-hour course, in five two-hour sessions of Job Instructor Training. The trainers will be compensated by Illinois Institute of Technology, which will in turn be reimbursed from federal funds made available through the State Board for Vocational Education. I.I.T. will act as the scheduling agent, and, in cooperation with T.W.I. and the State Board for Vocational Education, will be able to render a real service to defense industries.

J. I. YELLOTT.

MIDWEST POWER CONFERENCE 1942

The 1942 meeting of the Midwest Power Conference will be held on Thursday and Friday, April 9-10, at the Palmer House, Chicago. This Conference is sponsored annually by the Illinois Institute of Technology with the cooperation of eight other midwestern universities and colleges and the local sections of the Founder and other engineering societies. The Conference is entering its fifth year under the present sponsorship. Its popularity and worth are evidenced by the more than one thousand individuals who attended the 1941 meeting.

The purpose of the Midwest Power Conference has been established as that of offering an opportunity for all persons interested in power production, transmission, or consumption to meet together annually for the study of mutual problems, free from the restrictions of required memberships in technical or social oganizations. It is felt that academic sponsorship of a conference permits the freest possible discussion ranging from the technical through the economic and into the social aspects of the subject.

The tentative program of the 1942 meeting, as outlined by the directorate of the Conference, includes sessions on Industrial Power Plants, Electric Power Transmission, Hydro Power, Diesel Power, Fuels and Combustion, and Central Station Practice. The latter session is to be conducted by the Chicago Section of the American Society of Mechanical Engineers. Among the proposed papers for the various sessions are the following: Experience with Priorities for Equipment and Maintenance, Industrial Production and the Welfare of the Nation, Boiler Circulation Problems, Furnace Design Development, Recent Field Experience with Natural Lightning, Lightning-Proof Line Design, Prevention of Outages on Transmission Systems, The Future Development of the Missouri River, Water Power Development in the Light of War Industrial Activity, Results Obtained by Spreader Stokers with Continuous Ash Discharge, Procurement of Fuels, Diesel vs. Steam Locomotives, Recent Developments in Diesel Engine Design, Power in the Milling Industry, and Feedwater Treatment in Small Power Plants. The tentative program also includes joint luncheons with the Chicago Sections of the American Society of Mechanical Engineers and American Institute of Electrical Engineers, an All-Engineer's Dinner on the evening of April 9, and a Smoker on the evening of April 10.

The Nation's power problems were never more urgent than at the present time. The sponsors of the Conference extend to all who have an interest in the field of power a cordial invitation. Why not mark the date, April 9-10, 1942, on your calendar now?

The Preliminary Program of the Conference will be printed in the March issue of the ILLINOIS TECH ENGINEER ALUMNUS.

Inquiries in regard to the Conference may be addressed to either Stanton E. Winston, Conference Director, or Charles A. Nash, Conference Secretary, in care of the Illinois Institute of Technology, 3300 Federal Street, Chicago, Illinois.

THE DESIGN OF PLASTIC PRODUCTS

By

J. O. REINECKE

An article on engineering plastic products is just a little bit like a course of lectures about the current war; it is necessary to take every other day off to catch up with the latest developments, some of which have probably made the most recent statements completely wrong. The speed with which the industry has developed, and still is developing, is without parallel in the industrial world of today. Not since the advent of the age of steel has there been a material with so many and so varied possibilities for use in engineering design.

Within the past decade literally hundreds of new uses have been found for these new materials. Designers' first experiences with plastics were with their use as strictly ancillary pieces—knobs, bezel plates, and so forth. Ten years ago the industry was not yet even in its infancy, but in its pre-partum stage, alive and growing, but as yet unorganized and almost completely amorphous. Since that time, plastic parts, larger than even the materials manufacturers themselves had ever dreamed of, have been produced.

It was rather fortunate—and here the industrial designer may take his bow—that plastics, coming when they did, were pretty well contemporaneous with the rapid growth of industrial design. This has probably been the greatest single factor in their rapid adoption. There has almost never been a material which had such great appeal to the creative designer. The wide range of color possibilities; the depth and delicacy of tints which were possible; the many tactile qualities which plastics possessed — these attributes made plastics materials pretty much the answer to the designer's dream. So much so, in fact, that plastics sometimes got a black eye through their enthusiastic but ill-advised adoption.

Plastics are not, as even the plastics manufacturers have admitted, a panacea to cure all the production problems of today's industry. But they do have a very definite place in today's engineering picture, and that place becomes increasingly more important. Not too strangely, the development of plastics has had a salutary effect upon other materials as well. Before their advent, even consumer products for the most part followed the policy of Henry Ford: "Any color, as long as it's black." Consumer products' range, it should be admitted, was twice as great; they also offered white. But since the buying public became conscious of the possibilities of color—largely through the introduction of plastics—the other materials have followed suit. The function of plastics here was to refocus attention on some of the qualities which had been lost sight of after the turn from handicrafted to machine-made products—qualities of surfaces smooth without gloss; of rich, true colors; and of warmth to the touch—the last being a quality which is found in almost no other mechanically-produced materials.

So much for the quick history of the development of plastics. To be sure, they are still in their developmental stages, and the only thing one can be sure of in discussing today's plastics is that "there'll be some changes made." Ten short years have seen their development from materials used only in cigarette boxes and knicknacks to substances which the aforementioned Mr. Ford is now seriously considering for the manufacture of automobile bodies. What the next ten years will bring—or even the next ten months — is purely conjectural. An example of the rapid development of a specific type of plastic material is polystyrene. Four years ago polystyrene was known practically nowhere except in the material manufacturer's experimental laboratories. But within a short time it came rapidly to the fore as a plastic material, because of a number of rather special attributes—its high dielectric constant, resistance to moisture, extreme lightness, and adaptability to injection molding.

Polystyrene is so well adapted to so many uses that one recent product is molded entirely of the material. This product, a fruit juicer designed for the consumer market, is made of a molded plastic because of the color and form which that material permits; it is molded specifically from polystyrene, because this plastic is highly resistant to moisture and discoloration and produces a device even lighter than the aluminum juicer which is replaced. Production men who are currently tearing their hair because of the national defense emergency might incidentally be interested in a product which has turned from metal to almost 100 percent plastic.

There are certain fundamentals concerning plastics which are still valid, despite the rapid strides the industry is making. The division into thermosetting and thermoplastic materials remains: that is, phenol-formaldehyde and urea - formaldehyde (e. g., bakelite, beetle) polymerize when they are "cured" in the mold; while the acetates and others, (e.g., tenite) again become plastic and workable when reheated. In production, the differences are no longer so rigid, because a number of plastic molders have worked out methods of pre-heating the thermo-setting materials which makes it possible to turn out phenol-formaldehyde pieces with almost as great facility and speed as cellulose acetate products. This in itself typifies the kind of advance which really cannot be foreseen by any deductive process, because in the plastics industry there are always too many unknowns to allow such predictability.

Generalizations about the design of the plastic product—as opposed to the engineering of its production—are probably the most valid which can be made. Here there are definite don'ts and do's—especially don'ts—which are inherent in the material itself, and are seldom if ever disregarded by the engineer or the designer. Probably the most effective way of discussing the precepts of design is to examine the procedure which has been followed in a particular problem. Take for instance the case of a home thermostat, which subsequently won an award in the design competition held each year by MODERN PLASTICS magazine. (At that time, plastic housings for thermostatic controls were considerably

more of a novelty than now; few, if any, preceded this particular job.)

The accompanying illustration shows clearly the problem which was faced in the redesign — the integration of two diverse elements, the time-control and the heat-control, which were necessarily distinct from each other in size and shape. Practically any change in the thermostat as it appeared before redesign would probably have been an improvement, it must be admitted, because it was definitely not a handsome product.

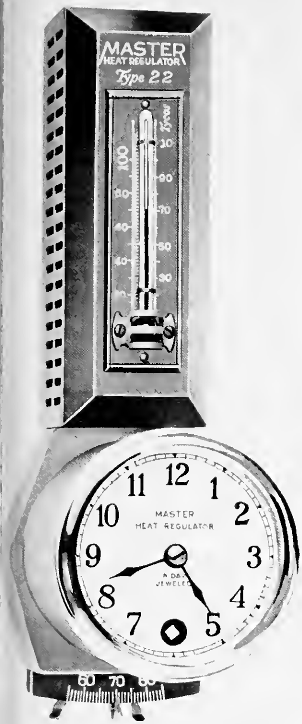
The first step in the design was the decision to reverse the position of the two parts, which started the re-vamping off on the right track; the new relationship immediately strikes one as the preferable one. Following this decision, it was necessary to decide on both the form and the material. There is no set order in which these problems are met; an engineer or a designer will sometimes have product which by their very nature must b wood, or metal, or glass; at othe times there is a rather wide latitud of choice. But because the materia

Fruit-juicer, before and after redesign. Note the smarter appearance and the color choice which has been made possible through the use of a light-weight, moisture-resistant plasti (polystyrene).

Photos Shigeta-Wright, Inc.

to be used often determines the ultimate appearance of the product, it selection sometimes must precede an other operation.

In this instance plastics had bee decided on because of their excellen tactile qualities, and because the wid range of color they permit woul make possible a color-arrangemen which would harmonize with jus about any interior. And the ol ivory and gold combination that wa chosen—the former the color for th plastic, the latter of the metal part —*is* a combination which fits well int any home interior. For the housin itself, following the rules of plastic design was relatively simple; wa thicknesses were everywhere equa (which permits even curing of th material in the mold); leaving the slo for insertion of the thermometer tub was a routine molding procedure Likewise, the avoidance of a shar



Home thermostat, before and after redesign. Use of a urea molding material permits a wide color choice as well as the rounded contours and generally modern appearance of this product.

angle at the point where the underwall of the clock joins the front wall of the thermostat housing was carefully observed so that no structural weakness would result.

The critical observer may well ask what function is served by the single line which extends down the face of the lower housing. It has none, in the sense that it performs an action. But it does very definitely serve a purpose, in that it serves to tie the whole design together, and to unite two elements which were previously somewhat autonomous.

A thermostat which was designed about one year later, (shown in the accompanying picture) was a very interesting problem. It had been decided that the slots in the housing *might* be eliminated, if they *could* be; they are useful, but scarcely attractive. This was accomplished by cambering the base-plate of the thermostat, and off-setting the housing by means of male and female lugs. Thus, a space almost a quarter of an inch wide, all around the thermostat, was provided; in addition to eliminating the slots, this actually aided in heightening the sensitivity of the device.

The choice of the specific type of plastic material is well illustrated by these two products, which are almost identical in function. For the earlier thermostat there was no question about the choice, it was either phenol-formaldehyde, or urea - formaldehyde, depending upon the colors desired, and the latter was chosen. For the same kind of job less than two years later, an injection-molded cellulose acetate material could be chosen. It was selected partly because the flexibility of the material made for a better friction-fit; but the real determining factor was that since the design of the earlier thermostat, injection molding had progressed to the point where molding a piece of this surface area, a ticklish job two years before, was now a routine matter.

It can thus be seen that the choice of a plastic material depends upon at least three factors: (1) the job to be done, (2) consumer - preferences and personal choice, and (3) production cost. All three are of fundamental importance, and none can be lightly dismissed when you consider the product not only as a problem in efficient, low-cost production, but also as a problem in appealing to the consumer. A chart to show which plastic materials are suitable for specific purposes would cover five or more pages; a short way to cover the subject would be to say, there is a plastic material for nearly *any* purpose.

This entire article might have been devoted to the subject of the cost of

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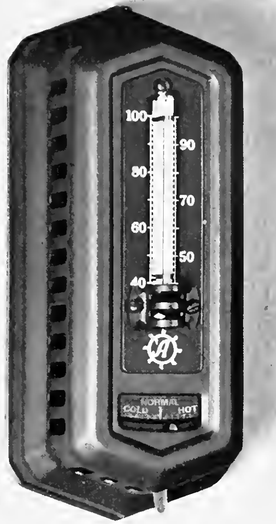
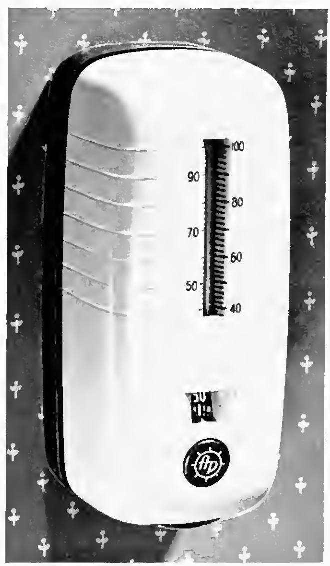


Home thermostat, before and after redesign. The slots in the housing have been eliminated, but the circulation of air is better and the sensitivity of the instrument greater. Housing is cellulose acetate, base plate phenolic.

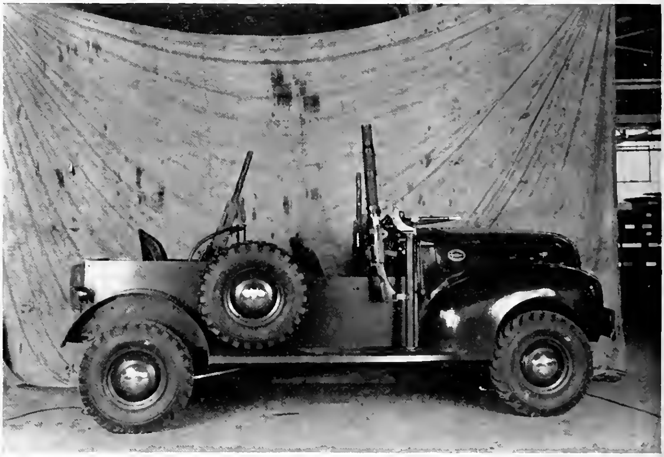


TRANSITION FROM PEACE-TIME TO WAR-TIME PRODUCTION OF AUTOMOTIVE VEHICLES

By
A. W. HERRINGTON

The problems incidental to the change-over from the production of commercial and industrial vehicles to the manufacture of military vehicles are many, even to a company like Marmon-Herrington which has been engaged in the design and building of some of the same general types of vehicles for a good many years.

The products of the company have never followed conventional lines, but have been highly specialized in character, for use under conditions which resemble in many ways those under which military units must operate. Our all-wheel-drive passenger cars and trucks, for example, have been widely used in such difficult types of cross-country operation as are encountered in the oil fields, in logging camps, in building and servicing telephone, power and light lines, in constructing and maintaining roads and highways, etc. The same abilities which made our all-wheel-drive ve-



Above: All-wheel drive light anti-aircraft machine-gun truck protects emergency landings, temporary landing fields, fuel and ammunition dumps, etc.

Left: Track-laying medium artillery tractor for towing mobile guns and carrying gun crews at high speed across country, fording streams, or as ammunition tractors.

hicles invaluable for these services, indicated their immediate demand, when the emergency arose, for military usage.

Similarly, our high-speed track-laying tractors, which are equipped either with short-pitch steel or continuous-band rubber tracks, originally designed for industrial services, were quickly convertible into military gun tractors and light combat tanks.

Furthermore, since most of the men identified with the company in executive capacities had seen active service in motor transport divisions in the World War, it was but natural that our vehicles had been under test by various military establishments for several years prior to 1939.

Thus the Marmon-Herrington Company had a running start at the outbreak of the present hostilities, and the principal job in going into all-out defense production was in the expansion of plant facilities with corresponding increases in personnel.

Nevertheless, there were problems, and there still are problems. These are of the kind that always arise when a company's plant facilities are multiplied five-fold in a period of only a little more than a year. They involve such matters as the procurement of machinery and materials under government priorities; the hiring and training of hundreds of new employees for highly skilled engineering and mechanical services; the working out of labor relationships, etc.

(Turn to page 57)

Top: All-wheel drive converted Ford with cargo body serving as anti-aircraft gun tractor and personnel carrier.

Middle: The light medium tank carries both machine guns and anti-tank gun, combining maneuverability, high traction, speed, and heavy striking power.

Bottom: Light medium combat tank on test.

NEW FACULTY MEMBERS

ROBERT W. ACKERMAN, Instructor in English, graduated from University of Michigan with the degree of A.B.; he has received the master's and doctor's degrees from the same university. He has held fellowships at Michigan and has taught at State College of Washington. Doctor Ackerman's interests are mainly in the fields of medieval literature, history, and philosophy. His publications have dealt with Chaucer and the Middle English romances.

HERBERT J. BERNSTEIN, Instructor in Chemistry, received his degree of A.B., with highest honors, at Swarthmore College; the degrees of M.S. and Ph.D. were awarded to him at Pennsylvania State College. Subsequently, he was an instructor at the latter school, and held a research fellowship at Princeton. Doctor Bernstein is a member of Phi Beta Kappa, Sigma Xi, and Phi Lambda Upsilon fraternities, and of the American Chemical Society. His special field of research is the mechanism of organic reactions.

EDWARD J. BICEK, Instructor in Chemistry, graduated from Carleton College with the degree of A.B., cum laude, with honors in chemistry. He was a teaching assistant and a university fellow at the University of Illinois, and received the Ph.D degree there in 1941. Doctor Bicek is a member of Sigma Xi, Phi Lambda Upsilon, and Alpha Chi Sigma fraternities, and of the American Chemical Society. His research interests at present are on cellulose and on beryllium.

ACKERMAN
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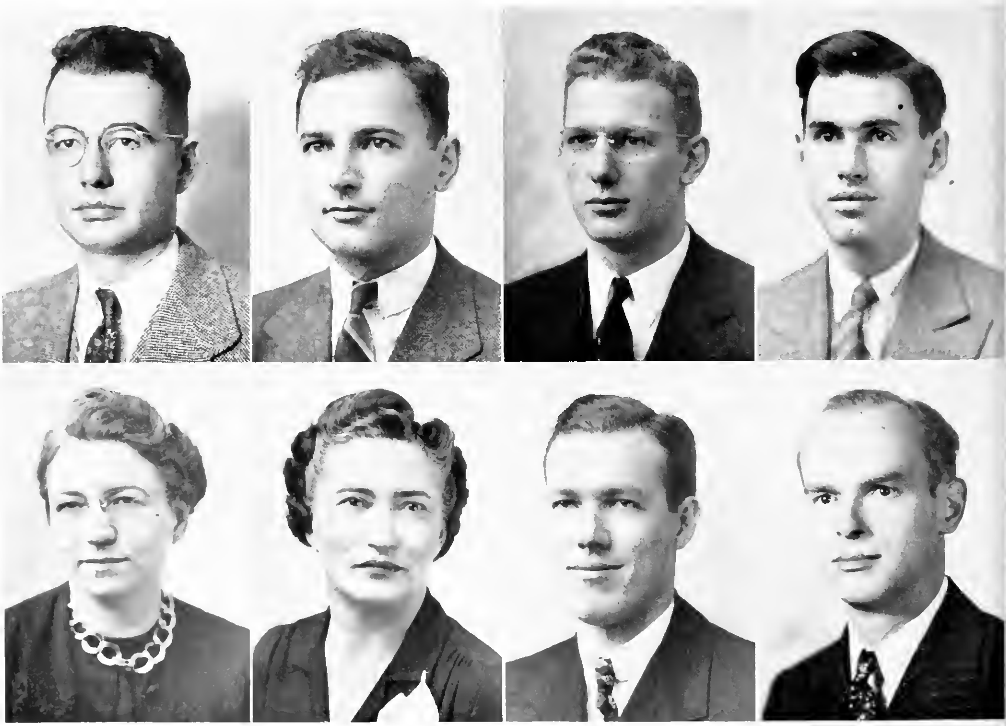
GRIFFITH



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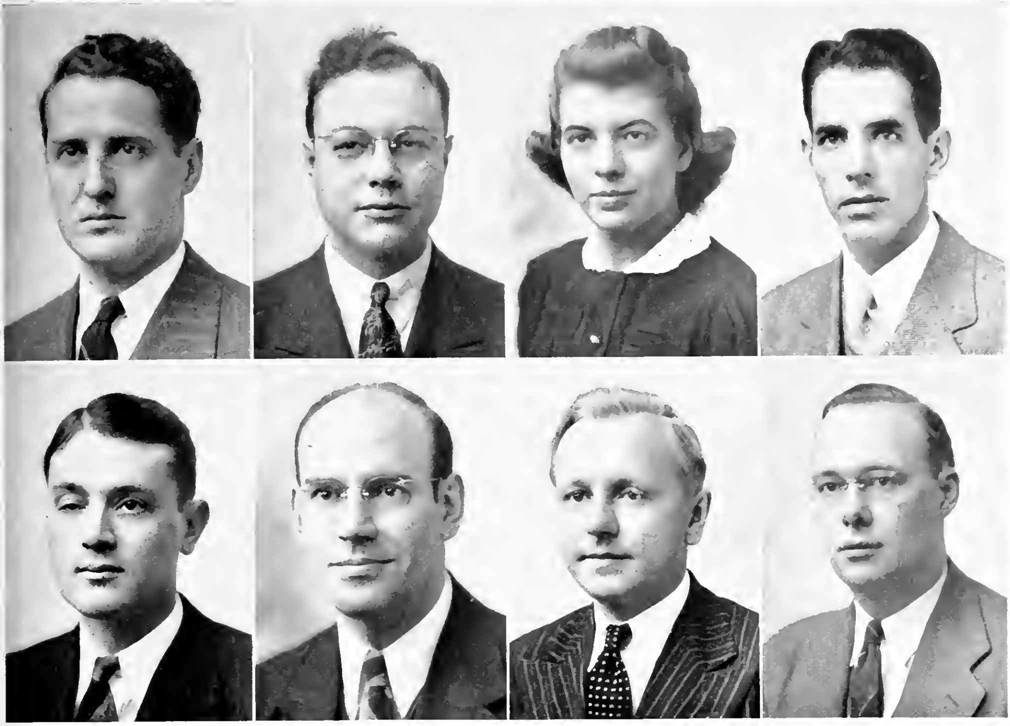

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HALFF — HOBSON — JOHNSON — HERSCHEL JONES
LOVING — READ — RICHTER — SCHIER

ROBERT F. CHRISTY, Instructor in Physics, graduated from University of British Columbia with the degree of A.B. He had first class honors in mathematics and was awarded the Governor General's gold medal for leading the graduating class. He did graduate work at the same university and at the University of California, holding fellowships at California. He received his Ph.D. degree from the latter university. Doctor Christy has had teaching experience at both universities.

RUTH COWAN CLOUSE, Director, Department of Home Economics, is a graduate of the University of Chicago, having received the degrees of S.B., S.M., and Ph.D. from that institution. She has been a member of the Home Economics faculties of the University of Arkansas, Michigan State College, the University of Chicago, and the University of Tennessee, and for the past six years has served as nutrition consultant on the headquarters staff of the Council on Foods and Nutrition of the American Medical Association. Dr. Clouse is the author of a number of articles on foods and nutrition and is co-author with Dr. Katharine Blunt of *Ultraviolet Light and Vitamin D in Nutrition*.

IDA M. DIDIER, Assistant Professor of Home Economics, is a graduate of North Dakota Agricultural College, and has done post-graduate work at University of Chicago, Wayne University, and Colorado State College of Agriculture and Mechanic Arts. She holds the M.S. degree from University of Chicago. She has taught at Little Falls (Minnesota) High School, Colorado State College of Agriculture and Mechanic Arts, and Maygrove College. Miss Didier has also been assistant to the Dean of Women at North Dakota Agricultural College, and home adviser in the home economics extension service of University of Illinois.

WILLIAM A. EDSON, Assistant Professor of Electrical Engineering, received his B.S. and M.S. degrees at University of Kansas, and the degree of Ph.D. at Harvard University. After some teaching and industrial experience, he was employed in research work at the Bell Telephone Laboratories, where he has been for the past four years. Doctor Edson is a member of Tau Beta Pi and Sigma Tau honorary fraternities.

Le Van Griffis, Assistant Professor of Mechanics, holds the degrees of B.S., M.S., and Ph.D. from California Institute of Technology. He was awarded an exchange scholarship at Karlsrühe, Germany, in 1938, but declined it. Doctor Griffis was with the Oregon State Highway Department in 1937 and 1938; he was subsequently in charge of the impact research laboratory at California Tech, and in 1939 was instructor at Armour Institute of Technology. He is a member of Sigma Xi.

Russell T. Griffith, Instructor in Chemical Engineering, received his B.S. degree at Purdue University, and his M.S. degree at Illinois Institute of Technology. He has been assistant chief chemist at the East Chicago refinery of Cities Service Oil Company. Mr. Griffith is a member of the American Institute of Chemical Engineers and the American Chemical Society.

Albert H. Halff, Instructor in Civil Engineering, is a graduate of Southern Methodist University, where he received the degree of B.S.C.E. He has had teaching experience at Texas College of Arts and Industries, and has been employed for three years with a firm of consulting engineers, being engaged mostly in the design and inspection of water supply and sewerage systems.

Jesse E. Hobson, Director of the Department of Electrical Engineering, graduated (with distinction) from Purdue University. He afterward received his M.S. degree at Purdue, and the Ph.D. degree, magna cum laude, at California Institute of Technology. He held research fellowships at both universities. Doctor Hobson has taught at California Institute of Technology, Earlham College, Armour Institute of Technology (1936-1937), University of Pittsburg, and Northwestern University. His experience in industry includes test work for the Boulder Dam-Los Angeles transmission line, work in the designing and building of a million-volt surge generator for California Institute of Technology, and nearly five years with Westinghouse Electric and Manufacturing Company. From 1938 to 1941 he was in charge of consulting service provided by Westinghouse for customers' engineers in the northwestern district. He is a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, Sigma Delta Chi, and Triangle, and an associate member of the American Institute of Electrical Engineers. In 1940 he received the Eta Kappa Nu award as the outstanding young electrical engineer in the United States; in the previous year he received honorable mention for the same award. Doctor Hobson is the author of numerous articles on electrical engineering subjects.

Patricia Johnson, Assistant Librarian, received her A.B. degree from Rosary College, River Forest, after majoring in library science. Miss Johnson is secretary of the College and Reference Section of the Special Libraries Association.

Herschel F. Jones, Instructor in Economics, did his undergraduate work at Hastings College and at Antioch College, receiving his A.B. degree from the latter school. He was awarded his M.A. degree at University of Nebraska. He has had varied business and newspaper experience, and has taught at University of Nebraska and University of Wisconsin. Doctor Jones has held fellowships at Wisconsin and with the Social Science Research Council. His major field of interest is public utility economics. During the past summer he was employed by the United States Department of Commerce as an associate economist, assigned to investigate the defense aspects of the St. Lawrence Seaway and Power Project.

Victor Jones, Assistant Professor of Political Science holds the degree of A.B. awarded by Howard College (Birmingham), and the Ph.D. degree from University of Chicago. He has taught in Coyoacan, Mexico, at Howard College, and at University of Chicago, and has served as research associate at University of California. Doctor Jones has contributed frequently to political science and other periodicals, and is the author of *Metropolitan Government,* to be published by University of Chicago Press in January.

R. O. Loving, Assistant Professor of Engineering Drawing, received his B.S. and M.S. degrees from Agricultural and Mechanical College of Texas, and has been on the faculty of that college since 1936. His undergraduate work was in electrical engineering, his graduate work in mathematics, and his teaching experience in engineering drawing.

SPENCER

THIESMEYER

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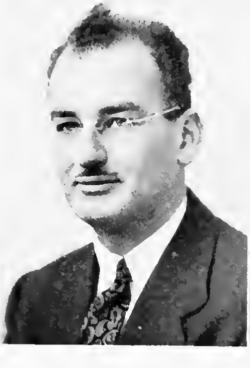

ZMESKAL

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Harold L. Minkler, Instructor in Engineering Drawing, has done undergraduate work at Armour Institute of Technology, Bradley Polytechnic Institute, Purdue University, and Agricultural and Mechanical College of Texas. He has taught at the two last-named schools.

Allen Walker Read, Instructor in English, received his B.A. degree at Iowa State Teachers College, his M.A. degree at State University of Iowa, and the B.Litt. degree at Oxford University, where he held a Rhodes scholarship. He has also done graduate work at University of Chicago, and has held a fellowship of the Guggenheim Memorial Foundation. Mr. Read has taught at University of Missouri and University of Chicago. He has been assistant editor of *Dictionary of American English,* and is now editor of *A Dictionary of Britticisms,* editorial associate on the magazine, *American Speech,* member of the executive council of the American Dialect Society, chairman of the Present-Day English group of the Modern Language Association of America, and contributor to various publications.

Friedrich-Karl Richter, Instructor in German holds the Diplome d'Etudes Supérieures from the University of Aix-Marseille, and the Ph.D. awarded by Staatsexamen, Breslau. He is the author of various articles in German and American periodicals, especially in *Monatshefte* of University of Wisconsin, and *Journal of English and German Philology* of University of Illinois. Doctor Richter has travelled in Iceland, Sicily, Poland, Scandinavia, and Mexico. He has taught in the Gymnasium at Breslau, at Oak Park Junior College, and at Doane College at Crete, Nebraska. For the past four summers he has been head of the German Department, Rocky Mountain School of Languages, Colorado College.

Donald S. Schier, Instructor in French, received his B.A. degree at State University of Iowa, his M.A. degree at Columbia University, and his Ph.D. at the same university. He held a travelling scholarship and studied in Europe in 1938 and 1939. Doctor Schier has been instructor in French and English at State Teachers College, Bemidji, Minnesota.

Walter Snyder, Instructor in Mathematics, holds the degree of A.B. from University of Chicago, and the degrees of M.S. and Ph.D. from Ohio State University. He has taught mathematics at Ohio State.

H. C. Spencer, Chairman of the Department of Engineering Drawing, received his B.S. degree from Baylor University, and the degrees of M.S., and of B.S. in Architecture from Agricultural and Mechanical College of Texas. Previously, he had studied art and mechanical drawing at several schools and under private instruction. Professor Spencer has had varied experience as a draftsman, a commercial artist, an illustrator for newspapers and other publications, and as a teacher, the latter involving three years at Ballinger (Texas) High School, and twelve years on the faculty of Texas Agricultural and Mechanical College, where, during his last year of service, he was head of the Department of Engineering Drawing. He is the author of several articles and of important books on mechanical drawing. *Technical Drawing,* by Giesecke, Mitchell, and Spencer, is in use by more than 200 colleges and universities, and in number of copies used annually is the leader in its field.

Victor L. Streeter, Associate Professor of Hydraulics, a graduate of University of Michigan, received his M.S.E. and Sc.D. from the same university. Subsequently he was a junior engineer in the United States Bureau of Reclamation, leaving this position when appointed to a travelling scholarship by the American Society of Mechanical Engineers. This involved a year of study in Germany and six months of travel in Europe and around the world. He served again in the Reclamation Service, and later with the International Boundary Commission, United States and Mexico. Doctor Streeter has been the recipient of the Collinwood prize for Juniors, awarded by the American Society of Civil Engineers. He is a member of the American Society of Mechanical Engineers, and an associate member of the American Society of Civil Engineers.

Lincoln R. Thiesmeyer, Student Counselor and Associate Professor of Geology in the Institute of Gas Technology, received the A.B. degree at Wesleyan University, and the A.M. and Ph.D. degrees at Harvard University. He has taught at Wesleyan, Harvard, Dartmouth, Radcliffe, and Lawrence. He has held several research and administrative posts, has traveled extensively and is a member of Sigma Xi and of several scientific societies. Doctor Thiesmeyer has written numerous articles for mineralogical and geological publications.

Frederic R. White, Instructor in English, received his A.B. and M.A. degrees from Oberlin; he has done graduate work at the Universities of Grenoble, Paris, and Chicago. He has taught at University of Michigan, and University of Toledo. Mr. White has received a major award in the Hopwood Creative Writing Contest; he has been president of the English Journal Club.

Alvin R. Whitehill, Instructor in Biology, received his A.B. degree at Dartmouth, and his Ph.D. degree at Cornell. For the past three years he has been assistant in biology at Cornell.

Otto Zmeskal, Assistant Professor of Metallurgy, holds the degrees of B.S. and M.S. from Armour Institute of Technology, and the Ph.D. degree from Massachusetts Institute of Technology. He has taught metallurgy at both colleges. Doctor Zmeskal has had experience as a consultant on problems in fourdrinier wire manufacture, stress corrosion in brass, and heat treatment of die steels.

ILLINOIS TECH RELAY GAMES

A parade of big names from the Big Ten, Big Six, Central Intercollegiate Conference, Little Nineteen, and of ambitious favorites from smaller colleges and universities will be the order of the day in March when John J. Schommer promotes the Fourteenth Annual Illinois Tech Relay Games.

Although the date has not as yet been fixed, the Games will cap the indoor track and field season of the academic year 1941-42 and will be held next March. The date will be announced through TECHNOMETER and TECHNOLOGY NEWS, and by special bulletins so that all alumni of the Chicago area may make early reservations for tickets.

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NEW TRUSTEES

Charles Donald Dallas, president and chairman of the executive committee of Revere Copper and Brass, Inc., was elected to membership in the Board of Trustees of Illinois Institute of Technology October 13, 1941. Mr. Dallas was born in Ontario, and graduated from Armour Scientific Academy in the class of 1902. He went to work for the American Brass Company as office boy at

$3.00 a week. Later, he became a salesman for the company. In 1908, he joined his father in the firm of A. C. Dallas and Son. The business prospered, and in 1918 the name was changed to Dallas Brass and Copper Company, and Donald Dallas became president. A merger of this and other companies formed Revere Copper and Brass, Inc., and Mr. Dallas was made president in 1931.

In its five plants, Revere is a notable exemplar of cordial relations between employer and employee. Its president is widely known for his grasp of the sociological aspects of industrial relations. On the engineering side, he has been the designer of handling machinery which has lessened heavy manual labor and contributed to plant safety.

For many years Mr. Dallas was president of the Hadley Correspondence School for the Blind, in Winnetka, Illinois, and he is now a member of its board of trustees. He is the author of *You and Your Money;* president of the Federation of Church Clubs of the Episcopal Church; and an officer of the National Industrial Conference Board and the Copper and Brass Research Association. He is a member of Blind Brook Country Club, Union League Club, Belford Golf and Tennis Club, Commonwealth Club, Chicago Club, Racquet Club, and Canadian Yacht Club. Mr. Dallas resides at 912 Fifth Avenue, New York City.

Harold S. Vance, recently elected to the Board of Trustees, has spent nearly all his working life with The Studebaker Corporation, beginning in 1910 as an apprentice mechanic. Two years after being employed by the company he was transferred to the specifications department; in 1915 he became assistant treasurer; in 1916, director of purchases. In 1917, on leave of absence from Studebaker, he joined Bethlehem Steel Corporation, and contributed to the notable war record of that company. Returning to Studebaker in 1919 as assistant to the president, he was successively appointed manager of the export division, general sales manager, and vice-president in charge of production. In 1935 Mr. Vance was elected chairman of the board.

When William S. Knudsen was asked by President Roosevelt to organize defense activities, he asked Mr. Vance to take charge of the all-important machine tool division. He served in this capacity until Studebaker's own defense activities compelled his return to South Bend in November, 1940.

He is a member of the Detroit Country Club, Detroit Athletic Club, Tavern Club (Chicago), and Indiana Country Club (South Bend). Mr. Vance lives at 110 North Esther Street, South Bend, Indiana.

THE SCHOOLMASTER

One of my boys has visited me. It is comforting to know that they like to come back. This one was in uniform. He is not conceited, but he could not fail to know how well he looked, in fine cloth, white navy cap, gold stripe and star on his sleeve, and, most important of all, the wings of his flying service on his breast. He flies a bomber. He teaches other fine boys to fly bombers. Our defense is strong, and it depends upon our boys, —our strong, clean youngsters.

Through the years we have seen thousands of them. They come to us from homes of many kinds. For some, their college years have meant strict economy. Some have gone into debt. They have worked hard. We have worked with them. For what? We thought, and they thought, that it was for something other than bombing, other than cannon and machine guns, other than bitter fighting in the air, on land, and at sea. Many more of our

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FINANCING THE WAR

By

BILLY E. GOETZ

Many people believe that we are still paying for the last war, and that our sons and grandsons will be burdened with much of the cost of the present war. The first of these beliefs is certainly not so, and the second probably will not prove true. We paid for the first war during the war. We shall probably pay for the present war in full before it is finished.

I.

Most economic errors are traceable to confused thinking about money and finances. The best remedy, where possible, is to get under the financial surface of things and deal with the physical realities. Many economic problems can be reduced to physical problems. Usually this results in a clear understanding of the problem and an undeniable conclusion.

In peace time we have a certain total annual physical production, represented in the diagram by rectangle A. Of this total physical production, some goes into consumer uses, such as food, clothing, etc., as shown by rectangle B, and the remainder goes into maintaining and improving our productive equipment, such as factory buildings and machinery. This was the situation in 1914.

Now, suppose a war commences. One thing that happens is an increase in production, shown in Figure 2 by the dotted addition to the total annual physical production. This increase is due to working overtime, due to decreased unemployment, and due to the employment of previously idle machine capacity. A second thing which happens is a reduction in consumption, shown by the shaded area in rectangle B of Figure 2. In the war of 1914-1918, we had gasolineless Sundays, meatless Thursdays, and other restrictions on consumption. In the present war we have already a priority system on aluminum and stainless steel, which will soon prevent consumer purchases of kitchenware made of these materials. In all likelihood, our pleasure automobiles of the next few years will be deficient in alloy steels, and consequently inferior to the product to which we are accustomed. We may all of us receive a higher dollar income, but rapidly increasing taxes will reduce the amount we have to spend. As a result, we shall wear our old clothes longer, in spite of style changes; we shall patch things which we have replaced in the past; and in other ways reduce our consumption.

In the war of 1914-1918 part of the increased annual physical production and part of the production energy diverted from consumption goods went into increasing the capital equipment of the country, resulting in an accumulation of wealth during the war. Notice that this increase had little to do with our trade with Europe, that it was simply a matter of working harder and pulling in our belts while we consumed less. The remainder of the additional production and of the productive energy diverted from consumption was drained off into the production of munitions and armaments which went into the war.

Thus, when the was was over, (1) we had provided everything that we put into the war; (2) we had increased our wealth, that is, we finished the war with more and better factory buildings and machinery; (3) we had paid the enormous load of

Fig. 1

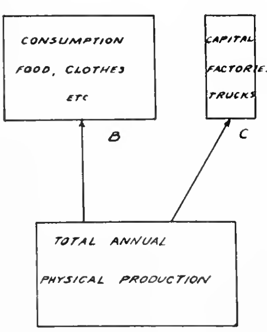


Fig. 2

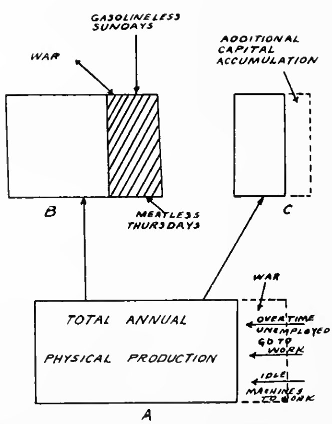
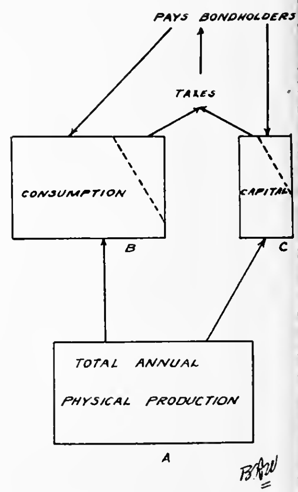


Fig. 3



debt owed by Americans to Europeans before the war started; (4) we had "loaned," or as it later turned out, given a large amount of material to our allies—a truly remarkable performance.

In the present war, we shall probably duplicate the experience of the last war. We are now engaged in building new factory buildings equipped with new machinery at a very rapid rate. Doubtless we will finish the war with a vastly improved producing ability. We are already engaged in sending large amounts of materials to England. From a physical point of view, the extra machinery installed at home, the war equipment of our own armed forces, and the help we are giving England are all coming out of increased production and restricted consumption. It is physically impossible for us to use our aluminum production to build airplanes, and use that same aluminum to make kitchenware for domestic uses. We cannot, try as we may, use the kitchenware of our grandchildren to make airplanes for use now. It is remarkably hard for one generation to pass on the costs of a war to succeeding generations.

It is true that the situation in France and Germany in the last war, and probably in this war, was very different. Both came out much poorer than they went in, and in the years that followed the termination of the war, the rebuilding of the destroyed capital of France and the wornout capital of Germany represented in a very real sense a partial payment of the cost of the war long after it was over. Both nations went into the war with substantial amounts owed to them by foreign countries and come out of the war with those assets liquidated. The present war seems to be repeating the past war in this also. Again a considerable amount of French capital has been destroyed and again Germany's capital is being worn out in the production of war material, without adequate replacement of production equipment. And of course in this war much of England's wealth has already been destroyed. Apparently all Europe will come out of this war poorer than it went in, and succeeding generations of Europeans will pay much of the cost of this war during the period of reconstruction.

II.

The physical aspects of the problem of financing a war are clear and incontrovertible. It is the monetary aspects which confuse people. In a dictatorship, the diversion of the additional production and of the capacity made available by restricted consumption to war purposes may be done by command, if necessary at the point of the bayonet. The diversion machinery of a democracy is more complex. It involves priorities, elaborate price fixing machinery and the purchase of the required war material by the government for cash.

The government can secure the necessary cash in one or more of three ways:

1. *By taxation.* Taxation has three advantages:

(a) it reduces the ability of the taxpayer to buy, which in itself tends strongly to restrict consumption: (b) taxation leaves no financial problems to perplex future generations; and (c) it provides the money the government needs to buy war goods.

2. *By borrowing.* Borrowing also deprives people of funds and so tends to restrict consumption. It also provides the government with funds to buy the required war supplies. However, borrowing leaves a fiscal problem of meeting interest and principal payments in the future. As a result, governments raise all the funds they can by taxation. There comes a time when further taxes will meet with too great a resistance by the taxpayers. The party in power tries not to carry taxation to the point where the opposition party can get elected. Before such an overturn in government takes place, the party in power resorts to borrowing.

3. *By printing paper money.* Having taxed all it dared and borrowed all it could, any further financing of war effort takes the form of printing paper money. Of course, in this country no government would do that. Having borrowed all it could from people having money, the government continues to borrow from commercial banks. By this stage of the economic effort the commercial banks have no money to lend the government to enable it to pay its soldiers and buy their arms. This is of little significance, because the commercial banks can take the newly purchased government bonds to the Federal Reserve bank, where the bonds will serve as collaterial for a loan. Of course, the Federal Reserve banks have no money to lend to the commercial banks to lend to the government to pay soldiers and buy arms, but this also is of little significance, for the Federal Reserve bank can take the government bonds to the Treasury and leave them as backing for a further issue of Federal Reserve notes. The Treasury then prints new money which it gives to the Federal Reserve banks, accepting the government bonds as security. The Federal Reserve banks turn the new money over to the commercial banks, and the commercial banks turn it over to the government to pay soldiers and buy arms. In this way, the United States succeeds in printing paper money without seeming to print paper money.

When this new money comes into the market and competes with the old money in the hands of producers and consumers for the same annual physical production, the intensified bidding by buyers raises the price level. If, when the war is over, the country is willing to keep the additional money in circulation and to let the higher price level continue to exist, there are no further perplexing fiscal problems to hand on to future generations. It is only the borrowing expedient which leaves a legacy of fiscal problems.

III.

After the war is over, the government might say: "We sold bonds to get money to help wage war. Now the war is over, we will forget the bonds." This would have the same result that increased taxes during the war would have had. The people who loaned to the government would in effect have paid higher taxes by the amount of the loan in the belief that they would get their money back. But after the war was over, the camouflage would be discontinued and they would be told that they had voluntarily paid the extra taxes represented by the loan.

This would be as fatal to the continued success at the polls of the party in power as the increased taxes would have been had they been levied without disguise. Consequently, the party in power cannot be expected to repudiate the bonds. Taxes must be levied and the bonds paid. At this point the total annual physical production is again being divided between consumption uses and capital replacement, as shown in Figure 3. Now the government drains off part of the consumers' purchasing power in the form of taxes. It also levies taxes against business corporations. However, it does not enter the market and divert part of the total annual physical production from the consumers and business companies. Instead, it pays the interest and principal to bond owners, who either use the money to buy consumer goods or invest it in business enterprise, which enables consumers to buy about as much as they would have had had there been no taxes and no payments on bonds. Likewise corporations can buy about what they could have bought.

Moreover, the taxes are collected

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...and I'll Bid "33 to 1"
I'll Double That!
STOP TALKING IN RIDDLES---WHAT D'YOU MEAN--- "33 TO 1"?
IT'S AN INVITATION TO A GRAND SLAM IN FLAVOR... AH, AND WE'LL MAKE IT, TOO!
IT'S PABST BLUE RIBBON. 33 TO 1...33 FINE BREWS BLENDED TO MAKE ONE GREAT BEER.
HMMM! SO THAT'S WHY BLUE RIBBON ALWAYS HAS THAT SAME SMOOTH FLAVOR.
I'LL RE-DOUBLE THAT 33 TO 1 BID...THE PAUSE FOR PABST IS THE BEST PART OF BRIDGE.
YOU CAN'T BEAT IT! BLENDING 33 BREWS INTO ONE DELICIOUS BEER WINS EVERY TIME!
AS IN THE FINEST COFFEE AND CHAMPAGNE, IT'S EXPERT BLENDING THAT GIVES BLUE RIBBON ITS SMOOTHER, TASTIER, UNVARYING GOODNESS. TODAY--TREAT YOURSELF TO A COOL, FOAMING GLASS--AND PROVE THAT BLENDING 33 FINE BREWS MAKES PABST BLUE RIBBON ONE GREAT BEER!
Enjoy it in full or club size bottles, handy cans, and on draft at better places everywhere.
Pabst Blue Ribbon
Blended 33 to 1
33 Fine Brews Blended to Make ONE Great Beer!
...IT'S SMOOTHER
...IT'S TASTIER
IT NEVER VARIES
Copyright 1941 Pabst Brewing Company Milwaukee

HELP! HELP! HELP!

Engineers are urgently required to fill positions of responsibility with good salaries, not only in industry but also in many governmental departments. The government now in many cases will waive Civil Service examinations and pass on each individual, taking into account his college training and his experience in industry.

Defense industries are seeking plant engineers, foremen, superintendents, and men with executive ability to take charge of tool and die shops, milling machines, screw machines, lathes, production, etc. One plant requires sixty-nine engineers for supervision at an average salary of $4000 per year. There are several jobs that this department is trying to fill at salaries from $10,000 to $20,000 per year. These attractive offers are for men with tool and die production experience, engineering experience, maintenance, and executive ability which will enable them to take charge of thousands of men and to coordinate their efforts.

The governmental requests cover a wide range. They are for junior engineers and for engineers experienced in radio, signal corps work, maintenance, machinery, cost production, production line and other positions with salaries ranging from $2000 to $6500 per year. Openings are for young men and also for men up to sixty years old. The Division of Civilian Supply of the Office of Production Management is urgently asking for *experienced men to go to work at once* in the following industrial branches: pulp and paper, printing and publishing, lumber and building materials, plumbing and heating, automotive farm equipment and transportation, rubber and rubber products, electrical appliances, consumers' durable goods, industrial machinery, and for state and local governments. For experienced men salaries range from $3200 to $5600 per year. To prevent delay on these governmental requests, please do not write this office. If you are interested, and you should be for patriotic reasons, in lending your heart and soul to your government in this gigantic endeavor to fulfill the urgent needs of the men who are to fight for you (don't forget; it takes about eighty-seven men behind the lines to keep thirteen men equipped to fight) address Norris B. Gaddess, Acting Executive Officer, Division of Civilian Supply, Office of Production Management, Washington, D. C.

This office is besieged by selective draftees and their mothers and fathers to find defense jobs for selectees caught in the draft. Remember that this office has all it can do in normal times; placement, athletics, my teaching, various committees and what not. Save this office time and money in answering telephone calls, letters, telegrams, and countless interviews in our office.

Please give heed. Those of you in the Army, when mustered out of service, should come here immediately or write if in need of a job. You engineers in the army can only get out by being mustered out, or released to the firm you left as a draft selectee, and then only on your former employer's request to the Under Secretary of War, Washington, D. C. To obtain the information necessary for this procedure, have your former employer write Major Lloyd Warfel, 105 West Monroe, Chicago, Illinois.

I have been trying for months, with the aid of many others, to induce General Lewis B. Hershey to have a provision set up whereby any employer of either governmental or defense industries who needs urgently the service of engineers may secure the release of any needed draftee engineer. To date, November 21st, my pleadings and urgings have fallen on deaf ears. When this condition is changed, I'll be in there pitching for you—not to get you out of the Army but to put your services to work where you can best serve your country, and that is in the engineering field either for defense industries or for governmental departments.

To those of you in defense industries who have 2B ratings in the draft, remember to keep in touch with your local boards. In case you change your jobs, report the change of your status within ten days. Comply with regulations and don't go wool gathering and then ask me to untangle the web you have spun about yourself. If you become married, tell the board immediately. If you are laid off, tell the board. Be honest with them, confide in them and they will treat you as a man and not be tough with you. If you change from one defense industry to another, you do not have to be in your new job three months before your new employer may ask for deferment. The whole case depends on defense orders and how you fit in your job by virtue of your training and experience and how valuable you are to your new assignment.

If you have a 2A rating, which covers student candidates for degrees and special training courses, then remember all 2A deferments are for not more than six months at a time and this deferment is granted according to shortages which have been shown by the O. P. M. to exist or are imminent. The findings of the O. P. M. are that a real shortage of qualified men exists in these categories: mechanical engineers, electrical engineers, chemical engineers, chemists, civil engineers, naval architects, mining engineers, metallurgists, and others. Deferment for students in these departments is given serious consideration and is based on answers to these questions:

1st. Is student enrolled in good faith? This is your local draft board's prime consideration.

2nd. Is student progressing satisfactorily? What are his grades? To obtain this evidence there is necessary an affidavit from your dean or registrar and periodic reports to your local board.

For fire protection engineers and architects no general information has been furnished to local boards. All are special cases. In all these cases you should come in and I'll go to bat for you.

John J. Schommer.

LOOK! *Seat Covers* OF LUSTROUS *Plastic* FOR YOUR CAR!

THE NEWEST STYLE note in motor cars is seat covers of smooth, lustrous plastic—custom made and woven from the remarkable Dow plastic, SARAN. This innovation in car slip covers offers light, attractive pastel shades—or, perhaps. transparency to actually reveal tints of the upholstery—in every way lending new smartness and distinction to the car's interior.

Now, for the first time, seat covers in light colors are practical because SARAN is quickly and easily cleaned with just a damp cloth. There is no danger of the colors running. You can ride on these seat covers in wet bathing suits, if you like. If windows are left open, have no fear of damage from summer showers. For, SARAN is waterproof plastic.

There is plenty of ventilation with SARAN seat covers—they're cool! The smooth surface permits you to slide easily into modern low cars without difficulty or the slightest danger of catching clothes or hose. The value in these new seat covers is exceptional because SARAN will out-wear the life of the car.

While, currently, seat covers of SARAN are custom made only, they are significant of a marked trend. They provide a striking example of the constant efforts of manufacturers to adapt plastics to numerous new products.

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND DEFENSE

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN
New York City—St. Louis—Chicago—San Francisco—Los Angeles—Seattle—Houston

OBITUARY

Wellington R. Townley, one of the oldest and best friends of the Institute, died at his home in Chicago, November 4, after a long illness. Mr. Townley was eighty years old.

For sixty years he was in the fire insurance business; for more than two-thirds of that time with the same company. He was always active in organization work, and his old-school geniality, and manifest enjoyment of the social contacts incidental to his work, made him a welcome member of many groups of insurance men, notably of the Round Table, a society of "elder statesmen" of the business.

Mr. Townley had definite literary ability, and real talent in the design and execution of fine illuminated manuscripts. He was editor of *The Philosophy of Fire Insurance*, in three volumes, the definitive edition of the writings of A. F. Dean, who was the outstanding authority on fire insurance rating.

In 1913, Mr. Townley was instrumental in establishing four scholarships in our Department of Fire Protection Engineering, the donor being The Underwriters Association of the Northwest. In 1920, when a larger scholarship system was established by the Western Actuarial Bureau, on the initiative of the late Jackson V. Parker, the earlier program was absorbed, and Mr. Townley became a member of the new scholarship committee. Thus, for more than twenty-eight years he was closely associated with an important plan of cooperation between business and collegiate education.

Students in Fire Protection Engineering at the Institute have a permanent reminder of Mr. Townley in the "shingle," the beautifully engrossed certificate of membership in the Fire Protection Engineering Society. He held honorary membership in this society, and in Salamander, the honor fraternity of the department.

THE BOOK SHELF

The Philosophy of Literary Form; Studies in Symbolic Action, by Kenneth Burke. Louisiana State University Press, 1941.

The volume under review contains one long monograph never before printed, "The Philosophy of Literary Form," and more than twenty essays and reviews which appeared in the course of the 1930's in this country's outstanding journals of criticism and opinion. In it, Mr. Burke has commented on a variety of literary types, ranging from the "pure poetry" of Coleridge's *Ancient Mariner* to the propogandising autobiography of Hitler, the notorious *Mein Kampf*. This critic illustrates and supports his interpretation of literature by frequent reference to music and the arts, to psychology normal and abnormal, and to history and sociology. He not only gives us a fresh and stimulating synthesis of the essential elements of the literary process but also fits this into the larger pattern of his conceptions of human life as a whole.

This wideness of view, possessed by few literary critics of any school, may be explained, insofar as any human endowment is explicable, as the product of Mr. Burke's rich and varied experience as creative writer, translator, essayist, critic, and lecturer. Two at least of his books, *Permanence and Change* and *Attitudes Toward History*, may be said to have vitally affected the "Weltanschauung," the attitude toward existence, that is, of many of the generation of Americans now come to maturity. His other books and his prolific output of articles and reviews in the leading periodicals have reinforced that influence. In his capacity of music editor, first of the *Dial* and later of the *Nation*, he contributed significantly to the understanding and enjoyment of music. Students who sat under him at the University of Chicago and at Syracuse University will not soon forget his vitality as lecturer and conversationalist.

Despite the extending of discussion in his latest volume to many varieties of literature and despite the wide ranging of his speculative faculty, Burke has preserved an essential unity of approach to the phenomena of literary expression. He concerns himself with the particular, of course, but always with the end in mind of establishing from the study of the particular the essential psychological mechanisms which operate in the case of the creative writer to condition what he writes and in that of general humanity to condition the use and enjoyment of what the artist gives it. In this review, comment and citation will be limited to the first piece in Burke's book which quite adequately represents the point of view and methodology consistently maintained throughout the volume.

Burke regards the act of literary creation primarily as an attempt of the creator to cope with a psychological situation of compelling importance to him by verbal means of varying complexity and intelligibility. The situation, for example, may be a feeling of guilt or failure which he cannot dissipate by any atonement or reformation in the extra-literary world. This man will create a fiction in which a character with whom he consciously or subconsciously identifies himself is rid of a sin either by personal atonement or by transference of it to a "scapegoat." He thus puts away his feeling of guilt or inadequacy symbolically, whether he realizes what he is doing or not.

In the *Ancient Mariner,* Coleridge, as Burke sees it, symbolizes himself in the Mariner and his drug addiction in the Mariner's slaying of the albatross. He symbolically purges himself of his weakness for opium (which he cannot conquer in the extra-literary world) by having the Ancient Mariner in part atone for the slaying and in part transfer his guilt to two "scapegoats," the Pilot Boy and the Wedding Guest.

Such a procedure as Coleridge's, however much it might be cavilled at as an escape from reality, did solve for him in a measure an unbearable conflict not to be solved in any other way. And symbolic activity of the poet is by no means always a mechanism of escape. It may, and for the sturdier nature, will be a strengthening of himself to face the blood, sweat, and tears of his life and triumph over them. Burke says:

> Critical and imaginative works are answers to questions posed by the situation in which they arose. They are not merely answers, they are *strategic* answers, *stylized* answers. For

there is a difference in style or strategy, if one says "yes" in tonalities that imply "thank God" or in tonalities that imply "alas!" So I should propose an initial working distinction between "strategies" and "situations," whereby we think of poetry (I here use the term to include any work of critical or imaginative cast) as the adopting of various strategies for the encompassing of s i t u a t i o n s. These strategies size up the situations, name their structure and outstanding ingredients, a n d name them in a way that contains an attitude towards them.

The act of writing then, if it is performed with any sincerity, is to the writer more than a performance to earn bread and butter and more than an exercise of virtuosity in following hard and fast rules of current rhetoric and esthetic; it is his response to a compelling need in himself for peace, or strength, or joy. But the writer is only one party in the relation of literary communication. If what he writes is significant only to himself, the value of it, according to any conceivable social standard, is rather slight. It will benefit society only indirectly and insofar as it makes him a more perfectly adjusted social animal.

To be great as literature, it must communicate — communicate, that is, the "situation" of its author and his "strategy" in meeting it. Let us use again the example of the strategy of throwing off a sense of guilt. The reader, if he is burdened by guilt, may participate imaginatively in the author's symbolic casting off of sin, whether or not his guilt is like that of the author's. He will so react, to a degree proportionate to his sensitivity and to the power of the author's verbal magic. The latter must constitute its possessor's claim to greatness, and its measure is the response of intelligent readers over a period of time. The response of each one of them is a reinactment, with individual variations, of the original process of creation. Says Burke:

> And the reader, in participating in the poem, breathes into this atomic structure a new physiological vitality that resembles, though with a difference, the act of its maker, the resemblance being in the overlap between writer's and reader's situation, the difference being in the fact that these two situations are far from identical.

The reader, different though his background must be from that of the poet, is, as a fellow human being, capable of participating in the experience revealed in the poem. As Burke points out:

> Yet we may respond to the imagery of guilt from totally different private goads of our own. We do not have to be drug addicts to respond to the guilt of a drug addict. The addiction is private, the guilt public. It is in such ways that the private and public areas of a symbolic act at once overlap and diverge.

What is the mechanism by which the imaginative writer verbally enacts for himself a strategy of meeting a situation and communicates it to his audience? It is essentially this: the representation of situation and strategy in terms of other situations and acts—that is, not literally, but symbolically, or—to put it in other ways —figuratively or imagistically. Verbal symbolism or imagery, as it is also called, has meaning to human beings because of their powers of association. To most of us, for example, darkness symbolizes the dangers which are hidden or the wrongdoing protected by it. Or the shepherd symbolizes other protective agents, because we associate the one type of protector with the others.

Insofar as the reader understands the symbols used by an author in a piece of writing he will adopt similar strategies to achieve similar ends. The success of the poet in communication depends upon his ability to make his own personal symbols the symbols for the situations and strategies of his reader. Conversely, the acuity of the reader or of the literary critic is measured by his ability to understand sympathetically the "equations" between events and symbols implied by the creative writer. Burke puts the matter this way:

> Now, the work of every writer contains a set of implicit equations. He uses "associational clusters." And you may, by examining his work, find "what goes with what" in these clusters —what kinds of acts and images and personalities and situations go with his notions of heroism, villainy, consolation, despair, etc.

The poet is less precise than the mathematician in working out his equations. He does not demand identity but is content if the two situations have something in common. Thus, for him, the part may equal the whole; the individual, its class; and the cause, its effect. Burke remarks:

> "Statistical" analysis discloses the ways in which a "symbolic" act is "representative," as Lady Macbeth's washing of her hands after the crime is "representative" of guilt. This moves us into the matter of synecdoche, the figure of speech wherein the part is used for the whole, the whole for the part, the container for the thing contained, the cause for the effect, the effect for the cause, etc. Simplest example: "twenty noses" for "twenty men."
>
> The more I examine both the structure of poetry and the structure of human relations outside of poetry, the more I become convinced that this is the "basic" figure of speech.

There are, broadly speaking, two strategies which a poet may use to meet a situation or to prepare his readers to meet it. He may try to steel himself and them to brave the danger involved in it and to summon up the energy demanded by it either by admitting and even magnifying the gravity of the situation or by denying its gravity. The first method is analogous to the process of vaccination in medicine, by which the patient is prepared to resist a disease by being made to experience some of its effects before he is exposed to it. This method emphasizes the threat of the situation, makes it endurable by prehabituation, and even makes it fascinating because of its very danger. We call a poem produced by this technique sublime or beautiful just as we call a canyon or volcano into which it would be death to fall sublime or beautiful.

The other method is to minimize or totally deny the gravity of the situation by laughing at it and making it ridiculous to the reader. The poet prepares himself and his public for what threatens them as the soldier relieves his fear and his comrade's by joking outrageously, the more outrageously as their danger is greater.

Whether the artistic product is the beautiful or ridiculous, the mechanism used is, of course, the symbolic. If the situation is equated with sublime symbols the product is beautiful; if, with pretty or incongruous ones, it is ridiculous.

Burke summarizes these antithetical strategies thus:

> The threat is the basis of beauty. Some vastness of magnitude, power, or distance, disproportionate to ourselves is "sublime." We recognize it with awe. We find it dangerous in its fascination. And we equip ourselves to confront it by piety, by stylistic medicine, and by struc-

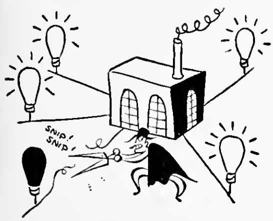
(Turn to page 59)

When power must not fail!

How a Westinghouse Distribution System Foils Lightning, Accidents, and Saboteurs

BEHIND America's urgent defense production, stands electric power. It runs the machines that turn out the weapons for the defense of America. It must not fail, must not even falter.

In the first World War, this vital power could be cut off, and cut off easily . . . by saboteurs, by accidents, or by lightning.



► For, in those days, the *only* means of distributing electricity was through *radial* systems, in which the power lines radiated like the spokes of a wheel with the power station as the hub. So, if *any part* of a power line were damaged, no electricity could be delivered to users *all along the line*.

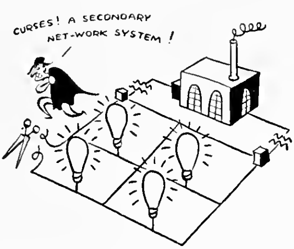
No way was known to reduce the vulnerability of power distribution until the early '20's, when engineers of a large power company conceived the idea of the *secondary network system*.

► The idea was to connect low voltage secondary lines in a *network*, with the main power (primary) lines joined to the network at several places. Thus, with power being sent along several different routes, a line could be damaged and electricity would continue to flow to its users along the other routes.

It was a great idea . . . if it could be made to work on large and complicated city systems. That was the problem, a problem which the power company brought to Westinghouse engineers.

► The secondary network system wouldn't work at all until some pump-proof method was found to keep power from flowing backwards into a damaged section of the line. Westinghouse engineer John S. Parsons (a member of Georgia Tech's class of '21, a graduate of the Westinghouse Training Course, and the holder of 30 of the 150 patents on secondary networks) found the way . . . a pump-proof relay which, when power is flowing in the wrong direction, closes its contacts and causes a network protector (automatic air circuit breaker) to trip and cut the feeder off the line.

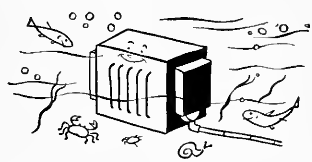
Then, there was the question of where to put the transformers, relays, and protectors that secondary networks needed. The amount of space this equipment would take up would be tremendously expensive in crowded cities.



► The obvious way to overcome this obstacle was to put this secondary network equipment underground. But transformers, relays, and protectors wouldn't perform properly in damp underground atmosphere. Westinghouse engineers went to work and developed a transformer-relay-protector unit that could fight off dampness and perform as well underground as above ground! Now, there are network units that do their job even though submerged under salt water, twice a day!

To make doubly sure that they had the space problem licked, Westinghouse engineers cut down the size and stepped up the power capacity of these network units. They made it possible for a unit that was one-third smaller to do the same electrical jobs!

► Secondary networks raised all sorts of new problems. And Westinghouse engineers had to find a lot of new answers before they were able to bring secondary networks from an idea to a working distribution system.



Today, Westinghouse engineers have brought secondary network systems to 164 cities. They've adapted these systems to the specialized needs of defense plants, army camps, airports, and power houses. Their work has contributed tremendously to today's ability to distribute unfailing electric power . . . despite lightning, accidents, and sabotage.

★ ★ ★

► This story illustrates how Westinghouse engineers work. More than that, it shows how the Westinghouse Company works. For there are 1,500 engineers in Westinghouse . . . in service, in management in design, in sales, in every single branch of the business. These engineers give the company its point of view.

Westinghouse takes pride in the engineering behind its products. Its engineers are always analyzing its products, working over them, making them better. It has the engineer's impatience with the old and his eagerness to create the new.

► Engineers founded and built Westinghouse. Engineers will carry it on.

Westinghouse

Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

BETTER MOUSETRAPS

The measurement of stresses in structural members, machine parts, tools and other fabricated items is a science that is not new. Only the last few decades, however, have seen real systematic application in industry of the basic principles developed over the earlier years. Design problems have always taken into account a more or less detailed mathematical prediction of stresses to be encountered in the finished article. Often these calculations are adequate, but the failure of certain manufactured items and the embarrassing collapse of even some large bridges and dams have definitely shown the advisability of recheck by means of the various types of gauges and indicating instruments. In more recent years, it has been recognized that much of the actual original design work can be simplified and errors eliminated by laboratory methods.

Of rapidly growing importance in the industrial development work of the Armour Research Foundation is the Stress Analysis laboratory. This unit, coordinated with the other activities as an essential part of the Experimental Engineering section, is under the guidance of Dr. Clayton O. Dohrenwend, formerly of the University of Connecticut and at one time a member of the Armour Institute civil engineering staff. With its present expansion, it is being housed in new quarters in the main Research Foundation building, and a large part of its work is also done in the field.

Dr. Dohrenwend's investigations in the Research Foundation laboratories have included studies of dynamic forces and lateral stability in large overhead travelling cranes, analysis of stresses in the jaws of special pliers, the construction of railroad track frogs formerly subject to frequent failures, the action of deep beams under combined loads, design of the bottom members of the famed snow cruiser, stress analysis of big ore loading bridges in use at steel mills, and similarly diversified subjects. Still more recent are stress and fatigue studies in pipe fabrication and in the components of hydraulic control systems.

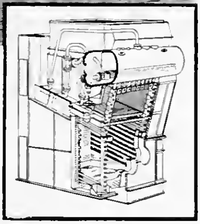
New recording electric strain gauge built at the Armour Research Foundation. W. R. Mehaffey, electrical research engineer who developed the circuit, is shown operating the instrument.

The new stress analysis laboratory is equipped with many types of special apparatus used in this work. Delicate mechanical gauges which, when fastened to structural members, register microscopic deflections under load, are available in a variety of forms each suited to a particular application. For accurate calibration the thin-film interferometer measures distances in terms of wave-lengths of light, and can detect a difference of less than a millionth of an inch.

Problems which involve stress distribution measurements frequently call into play the photoelastic equipment, housed in a special laboratory by itself. In using this unit a model of the piece under investigation is first made of a transparent plastic. The model, placed in the apparatus, is then subjected to predetermined loads while a beam of polarized light is passed through it. By projecting the resulting image on a screen, stress concentrations and danger-points stand out clearly in various colors, showing at once where design changes need to be made.

Ordinary static stresses under constant loads are easily measured by dial gauges and other mechanical devices. In some cases, however, the stresses exist only for an instant and may follow a complex pattern during that short time, as when a heavy locomotive passes rapidly over a steel bridge. Under such conditions static gauges cannot respond quickly enough, and if they could, the human eye could not catch the readings. The electric strain gauge is a most satisfactory answer. This type of instrument, recently refined and constructed in an improved form at the

(Turn to page 61)



POWER FOR DEFENSE

On a ship of the U. S. Navy in 1932, Babcock & Wilcox, the nation's oldest and largest manufacturer of steam boilers, first proved the safety and practicability of welding high-pressure boilers. This advance eliminated the former riveted boiler and led the way to higher pressures and efficiencies everywhere—more power at less cost.

Today, even while B & W is working on an unprecedented volume of defense orders for steam generating equipment, the Company's physical, metallurgical and chemical laboratories are energetically evolving new developments. Thus, because of B & W leadership, a ton of coal, a barrel of oil, a cubic foot of gas, or even a cord of wood, produces still more power for defense and for industry as a whole.

B&W Single-Pass Marine Boiler as used in modern merchant vessels.

●

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"The Design of Water-Tube Boiler Units." This liberally illustrated booklet discusses the factors involved in determining the proper type of steam generating unit for any given service. A copy will be sent to you on request.

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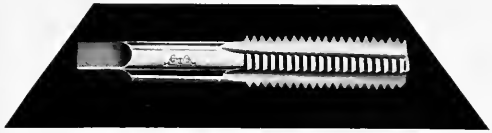

A TAP *LOOKS* QUITE SIMPLE

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To make *a good tap* for a particular job may require a special kind of steel, expensive automatic machines, milling machines, accurate grinders that will finish threads to dimensions much less than a human hair, and years of experience in heat treatment.

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VANCOUVER	MONTREAL	BOSTON	ST. LOUIS	LONDON

FROM YEAR TO YEAR

A RECORD OF ARMOUR ALUMNI AROUND THE WORLD

By

A. H. JENS, '31

MEN OF THE MONTH

For the first time since this series has appeared in THE ENGINEER, two men are nominated because of the close resemblance of their records. Royal Mooers Beckwith, F.P.E.,'24, and Kent Hamilton Parker, F.P.E., '28, are offered as the men of the month.

Early in September, Beckwith was selected to fill the position of assistant manager of the Eastern Underwriters Association in New York, and Parker succeeded him as assistant manager of the Western Actuarial Bureau in Chicago. Both positions are extremely important in the fire insurance business and carry heavy responsibilities.

R. M. BECKWITH entered Armour in 1920 with the first fire protection engineering scholarship group and was graduated in 1924. He was born and raised in Joliet, Illinois, where he received his primary education. He was graduated from Joliet High School in 1917, and joined the United States Marine Corps. He became a sergeant and served overseas with the Sixth Marines for eighteen months. Honorable discharge was granted after twenty-two months of service.

Upon returning to the United States after the war, Beckwith was determined upon gaining a college education. He attended Joliet Junior College for a short time and entered Armour with advanced standing in some subjects. At Armour, he made an outstanding record as a scholar and was rewarded with membership in Tau Beta Pi, national honorary engineering fraternity, and Salamander, honorary fire protection engineering fraternity. He engaged in numerous activities that included membership in the Fire Protection Engineering Society, of which he was vice president. He was treasurer of his Senior Class, student chairman of the Open House Committee and organizations editor of THE ARMOUR ENGINEER.

Hinchcliffe, LaGrange

BECKWITH

Gibson Studios

PARKER

After graduation from Armour in 1924, Beckwith became an inspector and engineer with the Michigan Inspection Bureau, where he served until 1927. His excellent work with the Bureau attracted the attention of the late J. V. Parker, who was then manager of the Western Actuarial Bureau. Beckwith was called to Chicago, where he mastered the complex sprinklered risk division of the insurance business. When Mr. Parker became general manager of the Western Actuarial Bureau in 1935, Beckwith was elevated to the assistant managership, where the scope of his work was greatly expanded.

Shortly after the death of Mr. Parker, Beckwith was made chairman of the fire insurance scholarship committee and with other members of this committee selected the men who were to attend Armour as scholarship students in the department of fire protection engineering. It was during

his chairmanship that important changes in the scholarship plan were adopted, especially with reference to the introduction of competitive examinations.

It is not unusual that a man of Beckwith's bearing would attract the attention of fire company executives in the western field, but to be selected to fill an important position in the east is a high tribute to the training he received at Armour, the Michigan Inspection Bureau and at the Western Actuarial Bureau. His new position in New York carries with it a heavy responsibility in carrying out the enlarged program of the Eastern Underwriters Association. He will act as executive assistant to the manager of the association.

Beckwith is a member of Theta Xi Fraternity. He is married and has one daughter.

Kent Hamilton Parker was born in Boston, Massachusetts, and moved to Portland, Oregon, at an early age. His family came to Chicago when he was six years of age and he received all of his common and high school training in the Oak Park schools. He took post graduate courses at Oak Park High School to qualify for entrance to Armour. He entered Armour in 1924 as a scholarship student in the fire protection engineering department.

Parker made a distinguished record at Armour. He was a student honor marshal, honor man in the department of fire protection engineering, and was named honor award senior number four. He was a member of Tau Beta Pi, national honorary engineer fraternity, Salamander, honorary fire protection engineering fraternity, Sphinx, honorary literary fraternity, and Pi Nu Epsilon, honorary musical fraternity. He was president of the Armour Fire Protection Engineering Society and was a member of the Armour orchestra and of the band. He was president of the musical clubs in his senior year.

Literary work took a great deal of his time and he served as fraternity editor of the Cycle. He was elected editor-in-chief of the Cycle and his book was given favorable attention by the students. He was a member of the honorary fraternity council.

Upon graduation from Armour, Parker headed for Australia and worked on a general cargo boat to earn his passage. The work was arduous and was probably the hardest he ever did. He returned to the United States in January 1929 and entered the service of the Fire Underwriters Inspection Bureau as inspector in the Dakotas. He was transferred to the Kentucky Actuarial Bureau in November 1929; there he acted as a special risk inspector and engineer. He did considerable work in preparation of reports covering hospitals and similar properties.

In the Fall of 1931, Parker was transferred to the Western Actuarial Bureau where he worked under the direction of the late J. V. Parker in developing the Analytic Schedule. From 1936 to 1941, he was in charge of the important schedule department where he attracted the favorable attention of the insurance business. He was appointed assistant manager of the Western Actuarial Bureau succeeding R. M. Beckwith in September, 1941. At the same time, he took over the duties of chairman of the fire insurance scholarship committee.

The professional degree of Fire Protection Engineer was awarded to Parker by Armour Institute in 1933 for his thesis covering a phase of schedule rating.

Parker is married, has two sons, and resides at 759 Barr Avenue, Winnetka, Illinois. His interests are mostly with his family, but he does get in a game of bridge and golf occasionally. He is a member of Theta Xi fraternity.

INDIANAPOLIS ALUMNI GROUP MEET

Indianapolis Alumni Group Meet . . .

Indianapolis was the scene of the first combined Armour-Lewis-Illinois Tech alumni gathering on November 10, 1941. Arrangements were completed by E. E. McLaren, F. P. E. '24, and E. W. Hildebrand, Lewis '17. The group assembled at the Washington Hotel, Indianapolis.

Representatives of the Institute made the trip to Indianapolis to give first-hand information on the scope of the tremendous program that is being undertaken at Illinois Tech. President Heald spoke briefly of the changes that have occurred since the amalgamation was completed. The future alumni program was described by B. P. Taylor, who is assistant to President Heald. Armour alumni president, J. W. McCaffrey, Ch.E., '22, told of developments in connection with the formation of the alumni group that is to include Armour, Lewis and Illinois Tech classes.

Among those in attendance were: M. J. Abrahamson, C.E., '28; L. P. Allaire, F.P.E., '27; E. W. Allen, Ch.E., '34; F. S. Andrew, F.P.E., '26; M. R. Beal, F.P.E., '32; S. A. Beatty, F.P.E., '30; J. D. Charlton, Ch.E., '40; R. I. Drum, F.P.E., '34; R. R. Eddy, F.P.E., '31; J. W. Gamble, F.P.E., '29; S. Gryglas, M.E., '38; I. A. Hockmiller, C.E., '32; K. E. Henriksen, M.E., '24.

C. E. Hockert, M.E., '37; G. Jenson, Jr., Ch.E., '33; O. J. Jenkins, C.E., '24; K. C. Langhammer, F.P.E., '31; R. J. Maci, M.E., '35; K. L. Macy, F.P.E., '28; H. W. Montgomery, F.P.E., '30; H. W. Mullins, F.P.E., '30; H. E. Nicholson, M.E., '23; D. J. Paul, F.P.E., '30; F. D. Payne, F.P.E., '28; E. D. Pierre, Arch., '15; S. E. Pihl, M.E., '33; J. A. Ransel, Arch., '30; P. V. Smith, F.P.E., '35; R. S. Walsh, F.P.E., '27; A. E. Wright, Ill. Tech., '41; J. W. Zvone, M.E., '33.

ADDITIONAL LIFE MEMBERSHIPS

The secretary-treasurer of the Armour Alumni Association advises that the following have been added to the list of Armour men who have secured life memberships in the association.

166 Arthur A. Kelkenny, E.E., '07
167 James A. Clear, M.E., '32.
168 William F. Finkl, Ch.E., '18.
169 Raymond F. Stellar, C.E., '29.
170 Henry Fabian, Ch.E., '28.
171 J. C. Chaderton, C.E., '39.
172 Thomas Kingsley, Jr., F.P.E., '20.
173 Joseph E. Monahan, M.E., '08.

According to the constitution of the alumni association, all life membership funds are accumulated in a special account that serves as a basis of the alumni student loan fund. This fund is administered by the alumni board of managers and is directed by W. N. Setterberg, Arch., '29.

Following is a listing of members of the graduating class of 1941, the companies by which they are employed, and their home addresses. Members of the class are urged to advise the Alumni Office when changes in position or home address are made. Personal information for use in future issues of the Engineer and Alumnus should be addressed to the Alumni Editor.

ARMOUR

Aberer, Joseph Charles, E.E., Garden City Engineering Co., 100 N. La Salle Street, Chicago. Residence: 215 E. North Avenue, Elmhurst, Illinois.

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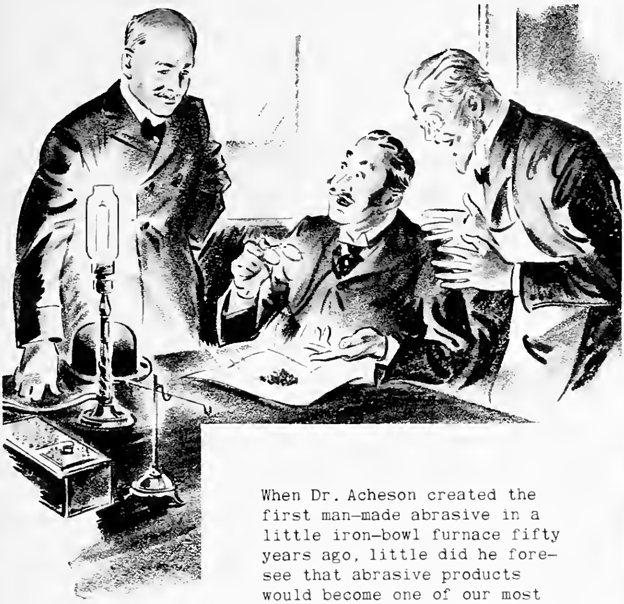
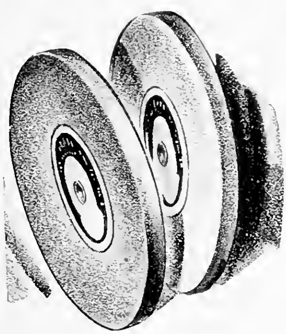


"You really made these crystals in an electric furnace?" the gem expert asked. "They look as if they'd been in the earth a million years!" "Certainly I made them", said Dr. Acheson. "And all I ask is that you crush them and try them instead of diamond dust for gem polishing." The expert did...and placed an order at $880 a pound! Today this same Carborundum Brand Silicon Carbide serves all industry, sells in grain form for as little as 16¢ a pound.

When Dr. Acheson created the first man-made abrasive in a little iron-bowl furnace fifty years ago, little did he foresee that abrasive products would become one of our most important production tools... that one day they would be used in the grinding, finishing, shaping and polishing of practically all the products of all industry.



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ANDERSON, CARL MERLIN, M.E., International Harvester Co. Pullman Works. Residence: 7135 S. May Street, Chicago.

ANTHONY, WILLIAM ORION, M.E., International Harvester Co. Residence: 6414 Kimbark Avenue, Chicago.

BAER, JOHN LEONARD, JR., Ch.E., Shell Oil Co. Residence: 11153 S. Park Avenue, Chicago.

BARRETT, ROBERT DAVID, M.E., International Harvester Co. Residence: 617 N. Cicero Avenue, Chicago.

BARTELDES, OTTO ERIC, C.E., Electro-Motive Corp., La Grange, Illinois. Residence: 1958 Roscoe Street, Chicago.

BARTHA, STEPHAN JOHN, E.E., Automatic-Electric Co. Residence: 3326 W. Crystal Street, Chicago.

BAUCH, WILLIAM FREDERICK, JR., C.E., mine transitman, Inland Steel Co., Wheelwright, Kentucky. Residence: Clubhouse, Wheelwright, Kentucky.

BAUER, ELMER JOSEPH, Ch.E., junior technologist, Shell Oil Co., Box 2527, Houston, Texas. Residence: 4705 Woodside Drive, Houston, Texas.

BAUM, GUENTER, M.E., Allis Chalmers Mfg. Co., Milwaukee, Wisconsin. For mail: 1087 Rose Avenue, Des Plaines, Illinois.

BAUMANN, GEORGE PERSHING, Ch.E., Grasselli Chemical Co., East Chicago, Illinois. Residence: 2517 Gunnison Street, Chicago.

BEBB, DALE MERLE, E.E., Highland Theater, 7857 S. Ashland Avenue, Chicago. Residence: 1370 W. 79th Street, Chicago.

BEDDOE, HAYDEN HENRY, Ch.E., plant operation training course, Jos. E. Seagram & Sons, Inc., 7th Street Rd., Louisville, Kentucky. Temporary residence: 962 Cherokee Rd., Louisville, Kentucky. For mail: 7001 Normal Boulevard, Chicago.

BERGER, ALBERT EDWARD, JR., M.E., Universal Castings Co., 5821 W. 66th Street, Chicago. Residence: 5339 Oakdale Avenue, Chicago.

BLUMBERG, LUDWIG THEODORE, Arch., Carnegie-Illinois Steel Corp. Residence: 1831 Orleans Street, Chicago.

BLUME, ARNOLD ELMER, Arch. Residence: 1295 Des Plaines Avenue, Des Plaines, Illinois.

BOARINI, EDWARD JOHN, Ch.E., U. S. Navy. Residence: 6921 Hobart Avenue, Chicago.

BOSE, MELVIN HENSEL, M.E., International Harvester Co. Residence: 3518 Reta Avenue, Chicago.

BRAUN, JEROME, M.E. Residence: 6915 N. Ashland Avenue, Chicago.

BRIERLEY, JOHN WILLIAM, Ch.E., Bakelite Corp. Residence: 1508 Byron Street, Chicago.

BRINKERHOFF, CLEAVER HENRY, C.E., Santa Fe Railway. Residence: 10635 Longwood Drive, Chicago.

BROWN, JAMES DAVID, E.E., General Electric Co. Residence: 4917 W. Grace Street, Chicago.

BULLEN, LEE, M. E., Ingersoll Steel Disc Co. Residence: 7611 Crandon Avenue, Chicago.

CARLSON, ARTHUR MAYNARD, Ch.E., Western Electric Co. Residence: 1805 N. Nordica Avenue, Chicago.

CLARK, WALTER JAMES, E.E., Western Electric Co. Residence: 7117 Dobson Avenue, Chicago.

COLANT, ERNEST JOHN, M.E., U. S. Army, central air corps, procurement district, Detroit, Michigan. Residence: 1754 S. W. 22nd Avenue, Miami, Florida.

COLE, BEN R., E.E., research department, RCA Mfg. Co., Inc., 201 N. Front Street, Chicago. Residence: 119 Prairie Avenue, Park Ridge, Illinois.

CORCORAN, JAMES PATRICK, E.E., Westinghouse Electric & Mfg. Co. Residence: 3819 Maypole Avenue, Chicago.

CREGO, DONALD FRANK, M.E., research department, Crane Co. Residence: 6128 Dorchester Avenue, Chicago.

CROUSE, EDWIN ROY, M.E., automotive laboratory, Illinois Institute of Technology, 3300 Federal Street, Chicago. Residence: 7753 Crandon Avenue, Chicago.

DAILEY, EUGENE EDWARD, C.E., Ramapo-Ajax, Chicago. Residence: 1015 Rittenhouse, Philadelphia, Pennsylvania.

DAVIS, JACK EDWARD, M.E. See class notes.

DECKER, WILLIAM JOHN, E.E., Commonwealth-Edison Co. Residence: 625 E. 70th Place, Chicago.

DE MONEY, FRED WILLIAM, F.P.E. See class notes.

DICKEL, GEORGE EDWARD, Arch., Cowles and Colean. Residence: 30 W. Chicago Avenue, Chicago.

DONOGHUE, LAWRENCE JOHN, C.E., Glenn L. Martin Co., Baltimore, Maryland. For mail: 5201 S. Park Avenue, Chicago.

DOST, EDWARD JOHN, JR., Ch.E., Standard Oil of Indiana. Residence: 2616 Argyle Street, Chicago.

DOYLE, JOHN B., Ch.E., General Foods, Battle Creek, Michigan. Residence: 21 N. Union Street, Aurora, Illinois.

DREFFEIN, OTTO FREDRICK, M.E., automotive laboratory, Illinois Institute of Technology, 3300 Federal Street, Chicago. Residence: 319 N. St. Louis Avenue, Chicago.

DRUSCHITZ, ALEXANDER, M.E., Teletype Corp., 1400 Wrightwood Avenue, Chicago. Residence: 2719 A Millard Avenue, Chicago.

DRYER, HENRY VICTOR, E.E., Line Material Co., Milwaukee, Wisconsin. For mail: 3002 Diversey Avenue, Chicago.

DUIKIN, H., M.E., U. S. Army Air Corps, Ford Motor Co., Dearborn, Michigan.

DURKEE, CHARLES EDWARD, E.E., Automatic Electric Co. Residence: 4215 Elston Avenue, Chicago.

EDUTIS, VITOLD LEOPOLD, E.E. Residence: 1111 S. Mozart Street, Chicago.

EHLERT, FREDERICK JAMES, C.E., State of Illinois Highway Dept., Chicago. Residence: 7028 S. Oakley Avenue, Chicago.

ELLIS, GEORGE STANLEY, C.E., Lockheed Aircraft Co., Burbank, California. Residence: 235 E. Holly Street, Pasadena, California.

FALK, SAMUEL ODIN, Ch.E., training course, Revere Copper & Brass, Inc., Rome, New York. Residence: 312 N. Jay Street, Rome, New York.

FIRSZT, JOSEPH JOHN, Ch.E., Frederick Post Co., 155 E. Ohio Street, Chicago. Residence: 2212 W. 21st Place, Chicago.

FLOOD, BENJAMIN EDWARD, F.P.E., Chicago Board of Fire Underwriters. Residence: 339 Franklin Avenue, River Forest, Illinois.

FLOREEN, EDWARD DORE, M.E., Allis-Chalmers. Residence: 300 N. Grove Avenue, Oak Park, Illinois.

FURCH, ALBERT LEO, JR., Ch.E., The Frederick Post Co., 3635 N. Hamlin Avenue, Chicago. Residence: 3341 Polk Street, Chicago.

FURSNER, WILLIAM EDWARD, M.E., Giddings and Lewis Machine Tool Co., Fond du Lac, Wisconsin. For mail: 372 Sunnyside Avenue, Elmhurst, Illinois.

GAUDIO, JAMES CARMEN, E.E., test department, Electro-Motive Corp., 55th and La Grange Road, La Grange, Illinois. Residence: 10610 S. Wallace Street, Chicago.

ENGINEERED WATER STORAGE

The elevated water tank shown above, in use at Indianapolis, Ind., is a beautiful and functional structure. Resting on tubular steel columns, radial girders support the 1,500,000 gal. capacity tank. The tank has a Radial-cone bottom, which has the shape a flexible container would have under similar conditions. One of the inner columns, used as the riser, is always full of water. Another, extending on above the water, is used as an access tower, and has a ladder inside it. The radial-cone design allows a large quantity of water to be stored with a small depth, or "range in head", thus tending to keep the water pressure in the mains constant.

The all-welded tank, built by the Chicago Bridge and Iron Company, has a diameter of 96 ft. The water is 30 ft. deep, and the columns are 54 in. diameter by 92 ft. high. The girder ends, cantilevered for a distance of 9 ft., are tapered at the ends to conform with the lines of this landmark of beauty.

GEHLE, FRED CHARLES, Ch.E., War Dept., Chicago Ordnance District, First National Bank Bldg., Chicago. Residence: 3420 W. 61st Street, Chicago.

GETZ, RAYMOND FRANCIS MARTIN, EE., Commonwealth Edison Co. Residence: 5250 W. Deming Place, Chicago.

GIANNINI, PETER ERNEST, M.E., U. S. Air Corp, Central Procurement District, Detroit, Michigan. For mail: 2161 De Kalb Street, Chicago.

GILIBERTO, JOHN, C.E., State of Illinois Highway Dept., Chicago. Residence: 208 W. 24th Place, Chicago.

GINSBURG, CHESTER, M.E., Midwest Equipment Co., 630 W. Lake Street, Chicago. Residence: 1220 W. Sherwin Avenue, Chicago.

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1898

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1899

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1902

Freeman, Ernest Harrison, E.E., Professor of Electrical Engineering at Illinois Institute of Technology, 3300 Federal Street, Chicago, resides at 601 Laurel Avenue, Wilmette, Illinois.

Lewis, Elijah, E.E., passed away at Des Moines, Iowa, on October 12, 1941. After leaving the Institute in 1902 Mr. Lewis worked under Mr. Steinmetz, where he gained invaluable experience in the electrical field. Before his death he conducted an electrical jobbing business in Des Moines, Iowa.

Nachmann, Henry L., M.E., Professor of Thermodynamics at Illinois Institute of Technology, resides at 1112 East 52nd Street, Chicago.

1904

Wickersham, Edward James, M.E., is mechanical engineer, U. S. Engineer Office, 4792 Sepdreda Avenue, San Bernardino, California, has recently changed his address to 1263 Arrowhead Avenue, San Bernardino, California.

1905

Beamer, Burton E., E.E., passed away on September 22, 1941, at Asbestos, Canada.

Harper, Robert Brinton, Ch.E., is vice-president, the Peoples Gas Light & Coke Company, 122 South Michigan Avenue, Chicago. His home is at 5000 East End Avenue, Chicago.

Parker, Worthington Francis, E.E., is president of the Standard Transformer Company, Warren, Ohio.

Payne, John Howard, E.E., is associate director, radio section, coordinator of Inter-American affairs, 444 Madison Avenue, New York City, and has changed his address to 130 Walworth Avenue, White Plains, New York.

1906

Hiller, Eugene F., C.E., is employed as salesman for the Union Central Life Insurance Company, 1 North LaSalle Street, Chicago. He resides at 5321 Woodlawn Avenue, Chicago.

Houghton, Vaughn A., M.E., who operates his own mechanical engineering practice at 565 Washington St., Chicago, has recently moved to 5562 Quincy Street, Chicago.

1907

Hebard, W. F., C.E., is owner and president of the W. F. Hebard & Company, 824 W. 36th Street, Chicago. His home is at 1238 Oak Avenue, Evanston, Illinois.

James, Sidney Vincent, M.E., is employed as engineer of the casualty and automotive department, Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago. He resides at 521 Barry Avenue, Chicago.

Heuchling, Frederick G., Ch.E., is director of Public Information Service for the Chicago Park District, 425 East 14th Boulevard, Chicago. Residence is 1310 Glenlake Avenue, Chicago.

1908

Glos, Harold Victor, M.E., is manager sales and property management division, Sontag Brothers, Inc., 2730 North Clark Street, Chicago.

Winser, Roy A., Ch.E., is chemist, research department, Armour & Company, 1355 West 31st Street, Chicago. His home is at 1400 Lake Shore Drive, Chicago.

1909

Beckett, Arthur C., Arch., is employed as specification writer for the 9th U. S. Naval District, Great Lakes, Illinois. He lives at 1010 Main Street, Evanston, Illinois.

Petty, Edwin W., E.E., is electrical engineer, water works design division, City of Chicago, Room 402, 121 North La Salle Street, Chicago. He resides at 4020 Woodlawn Avenue, Western Springs, Illinois.

Strong, Arthur P., E.E., is employed as sales engineer for W. A. Jones Foundry & Machine Company, 1401 Roosevelt Road, Chicago, and lives at 217 South Elmwood, Oak Park, Illinois.

1910

Pohlmann, Edward F., Ch.E., is employed as chief testing engineer, the Peoples Gas Light & Coke Company, 122 South Michigan Avenue, Chicago. His home is at 5643 South Honore Street, Chicago.

1911

Erickson, Oscar R., C.E., who is chief estimator for the Leonard Construction Company, 37 South Wabash Avenue, Chicago, lives at 7409 Evans Avenue, Chicago.

Friedman, Raphael Nathan, Arch., is senior partner of Alschuler & Friedman, 28 East Jackson Boulevard, Chicago, and resides at 5411 Drexel Boulevard, Chicago.

Hynes, P. Roy, C.E., is chief engineer, Acme Steel Company, 2840 Archer Avenue, Chicago, and lives at 5315 Taylor Avenue, Oak Park, Illinois.

James, Garrett Bell, Ch.E., who is in the engineering department, Western Factory Insurance Association, 175 West Jackson Blvd., Chicago, has recently changed his address to 823 Greenleaf Avenue, Wilmette, Illinois.

Johnson, John B., C.E., is employed by Acorn Wire & Iron Works, 5912 Lowe Avenue, Chicago, as sales engineer and is living at 820 North Ridgeland Avenue, Oak Park, Illinois.

Mandler, E. O., C.E., is owner of Mandler's Laundry, 164 Milwaukee Avenue, Chicago. He resides at 3284 Wrightwood Avenue, Chicago.

Robinson, J. Albert M., M.E., conducts a consulting engineering practice at 228 North LaSalle Street, Chicago. He resides at 9955 South Seeley Avenue, Chicago.

1912

Meade, G. Raymond, E.E., is a valuation engineer for the Illinois Commerce Commission, 160 North La Salle Street, Chicago. His home is at 1924 Washington Boulevard, Chicago.

Sincere, Edwin M., Arch., is general manager, Alschuler and Friedman, 28 East Jackson Boulevard, Chicago. He lives at 1727 South Ridge Road, Highland Park, Illinois.

Todtmann, Harry G., C.E., is employed by the U. S. Gypsum Company, 300 West Adams Street, Chicago, and lives at 1152 Cherry Street, Winnetka, Illinois.

1913

Stewart, John Logan, C.E., who is architectural representative, Celotex Corporation, 919 North Michigan Avenue, Chicago, has recently moved to 2136 Lincoln Park West, Chicago. He is a Major, Corps of Engineers Reserve, U. S. Army.

1914

Lang, Eugene C., E.E., is employed with Canavan & Lang, 231 South La Salle Street, Chicago.

Thelander, P. Victor, C.E., is division engineer, C. & N. W. Railway, Escanaba, Michigan, is residing at 1023 9th Avenue, South, Escanaba, Michigan.

1915

Diemecke, Curtis W., Ch.E., is district representative, L. J. Wing Manufacturing Company, 37 West Van Buren Street, Chicago. His home is at 1424 Kirk Street, Evanston, Illinois.

Downey, Lester S., M.E., is machinery designer, Allbright-Nell Company, 5323 South Western Boulevard, Chicago. He resides at 6620 Lafayette Avenue, Chicago.

Holmes, Seymour E., I.A., is director, Washburne Evening Trade School, and also acting assistant principal, Washburne Trade School, 1225 Sedgwick Street, Chicago. He resides at 2733 Windsor Avenue, Chicago.

Lauletta, Joseph R., Ch.E., is plant superintendent, Thomas J. Dee & Company, 1900 West Kinzie Street, Chicago.

Peterson, Stanley Moyer, Arch., is in business for himself as an architect and resides at 231 17th Street, Wilmette, Illinois.

Rietz, Walter H., F.P.E., is vice-president, Ilg Electric Ventilating Company, 2850 North Crawford Avenue, Chicago.

Sieck, Ernest, Ch.E., is chemist, Sieck & Drucker, 9 South Clinton Street, Chicago, and resides at 4810 North Winchester Avenue, Chicago.

Simmons, Charles R., C.E., is in business for himself as industrial engineer at 9 South Clinton Street, Chicago. He resides at 550 Greenwood Avenue, Kenilworth, Illinois.

Wilson, Robert Lee, Ch.E., is director of research, William Wrigley, Jr., Company, Chicago.

1916

Altman, Eugene E., C.E., is a junior civil engineer, Cook County Highway Department, and resides at 6550 North Ashland Avenue, Chicago.

Anning, Harold E., C.E., is owner of H. E. Anning Company, 1514 West Van Buren Street, Chicago. He resides at 2408 Payne Street, Evanston, Illinois.

Byanskas, John M., M.E., is employed as planning engineer, Western Electric Company, Hawthorne Station, Chicago, Illinois, and resides 281 Olmstead Road, Riverside, Illinois.

Cable, Max L., Arch., is president, Edison Building & Construction Company, 1241 North Ashland Avenue, Chicago. His home is at 5335 Magnolia Avenue, Chicago.

Edlund, Lawrence L., C.E., is employed as an engineer, Armour & Company, Union Stock Yards, Chicago, and resides at 8220 Langley Avenue, Chicago.

Foy, Edgar Allanson, C.E., who is senior inspector of construction, Navy Yard, Mare Island, California, writes that Harold O. Foster, C.E. '11, is also located there. His home address is 180 Edgemont Avenue, Vallejo, California.

Katzinger, Arthur, M.E., announces that he has recently changed his name to Arthur Keating.

Marx, Victor E., Ch.E., is the editor of Bakers' Helper, 330 South Wells Street, Chicago, and resides at 1541 Birchwood Avenue, Chicago.

Mundt, William C., C.E., is department adjutant and business manager, the American Legion, McBarnes Memorial Building, Bloomington, Illinois. He resides at 1103 Elmwood Road, Bloomington, Illinois.

Perlstein, George Bernard, Ch.E., is sales manager of the industrial products division, Pabst Sales Company, 221 North La Salle Street, Chicago. He lives at 6829 Paxton Avenue, Chicago.

Strauch, Frederic P., M.E., is president and treasurer, Pinkerton Folding Box Company, 120 Rush Street, Chicago. He resides at 1519 Central Avenue, Wilmette, Illinois.

Wetzel, Guy F., M.E., is an instructor at Lane Technical High School, 2501 Addison Street, Chicago, and lives at 1010 West Crescent, Park Ridge, Illinois.

1917

Luttge, Harold, M.E., is mechanical engineer, War Dept., St. Louis ordnance district, 1628 Commerce Building, Houston, Texas. He is residing at 2024 Des Jardines, Houston, Texas.

Platt, Abe J., M.E., is district manager for Balaban & Katz Management Corporation, 175 North State Street, Chicago. He resides at 914 Ainslie Street, Chicago.

Schreiber, Armin L., C.E., operates a gold dredge on Dry Creek near Placerville, California. He may be reached at P. O. Box 55, Route 2, Placerville, California.

Smith, Earl Hirst, C.E., has recently been transferred from the automotive engineering division of the Packard Motor Car Company to executive engineer of the aircraft engine division. His home address is 1210 Dorchester Road, Birmingham, Michigan.

Stryker, Clinton E., E.E., who is vice-president and assistant to the president, Nordberg Manufacturing Company, Milwaukee, Wisconsin, has recently changed his address to 6960 Barnett Lane, Fox Point, Wisconsin.

Thal, Samuel W., M. E., is production engineer, Acme Corporation, 1132 West 35th Street, Chicago. He resides at 7152 East End Avenue, Chicago.

Watt, William T., E.E., is vice-president and general manager, Maujer Publishing Company, St. Joseph, Michigan. He resides at 2308 Niles Avenue, St. Joseph, Michigan.

1918

Golten, Jerome N., EE., is with the Stewart-Warner Corporation, 1826 West Diversey Parkway, Chicago, and resides at 5126 Ingleside Avenue, Chicago.

1919

Lunde, Erling H., M.E., is owner and secretary-treasurer, Central Tools, Inc., 80 East Jackson Boulevard, Chicago, and resides at 6708 Olympia Avenue, Chicago.

1921

Malvin, Raymond C., E.E., is president, Malvin & May, Inc., 2015 South Michigan Avenue, Chicago, Illinois. He resides at 8220 Dante Avenue, Chicago.

Schlossman, Norman J., Arch., is a partner, Loebl & Schlossman, architects, 333 North Michigan Avenue, Chicago, and resides at 1415 Dean Avenue, Highland Park, Illinois.

1922

Herbst, Henry William, Ch.E., is president, Biwax Corporation, 1017 South Kolmar Avenue, Chicago, and resides at 2141 Beechwood, Wilmette, Illinois.

McCaffrey, John Warren, Ch.E., was married on November 22, 1941, to Agnes Larkin in Chicago. After a short trip residence is to be established at 7307 S. Bennett Avenue, Chicago. McCaffrey's law office is at 111 W. Washington Street, Chicago.

Novak, Brunor Zigmund, Ch.E., passed away suddenly on June 24, 1941, from coronary thrombosis. He was special agent in the St. Louis service department of the Home Insurance Company. His wife and two children survive him.

Sloan, Arthur H., E.E., is salesman for Oil Burning Engineers, 3146 West Chicago Avenue, Chicago, and lives at 1400 East 53rd Street, Chicago.

Colby, Donald C., EE., is a lubrication engineer for The Texas Company, 3052 Archer Avenue, Chicago, and lives at 6731 Jeffery Avenue, Chicago.

Rumely, Richard, Ch.E., is testing engineer, Commonwealth Edison Company 2233 South Throop Street, Chicago, and

resides at 3153 North Hudson Avenue, Chicago.

Temple, Robert A., E.E., is superintendent, Marblehead Lime Company, 3245 East 103rd Street, Chicago, lives at 7147 Jeffery Avenue, Chicago.

1924

Barrett, Eugene A., M.E., is president, T. F. Barrett Construction Company, Inc., 6429 South Park Avenue, Chicago, and resides at 8046 Drexel Avenue, Chicago.

Bender, John Axworthy, Jr., M.E., who is salesman, Mills Auto Parts, 1909 Atchison Avenue, Whiting, Indiana, has recently changed his address to 4341 Indiana Avenue, Chicago.

Burkey, Mack G., C.E., is in the Real Estate Department, First National Bank of Chicago, 38 South Dearborn Street, Chicago, and lives at 4364 Oakenwald Avenue, Chicago.

Douglas, William Bruce, C.E., is a civil engineer and surveyor, P. O. Box 91, Lake Forest, Illinois, and resides at 686 Northmoor Road, Lake Forest, Illinois.

Ennis, George H., Ch.E., is secretary-treasurer, Franklin Sharkey Company, Lexington, North Carolina, and has recently moved to 1400 South Main Street, Salisbury, North Carolina.

Poole, Frederick M., C.E., who is Lieutenant, U. S. Navy, is assistant plant superintendent, plant department, naval aircraft factory, Navy Yard, Philadelphia, Pennsylvania, has recently changed his address to 106 Lansdowne Court, Lansdowne, Pennsylvania.

Richardson, Donald E., E.E., is in charge of the electricity and sound department, Armour Research Foundation, 35 West 33rd Street, Chicago. His home is at 8146 Champlain Avenue, Chicago.

Schmid, Theophilus, Jr., C.E., is employed as assistant sanitary engineer, water purification division, City of Chicago, Navy Pier, Chicago. He resides at 10404 Sangamon Street, Chicago.

Veggeberg, Julian Maurice, M.E., is senior mechanical designer, City of Chicago Bureau of Engineering, Room 1006, City Hall, Chicago. His home is located at 1807 North Rutherford Avenue, Chicago.

1925

Beeler, Curtis R., C.E., who is engineer for the U. S. Gypsum Company, lives at 7745 North Hermitage Avenue, Chicago.

Benson, Earle G., M.E., is employed as mechanical engineer, bridge division, City of Chicago, Room 1001A, City Hall, Chicago. He lives at 7757 Merrill Avenue, Chicago.

Gaylord, Robert P., F.P.E., is chief engineer, Goodyear Aircraft Corp., Litchfield, Arizona. He may be reached at this address.

Greenleaf, John Simon, M.E., who is a claim adjuster, Motors Insurance Corp., has recently changed his address to 1600 South Douglas, Springfield, Illinois.

Hibbeler, Alvin F., E.E., is assistant engineer, Commonwealth Edison Company, 2233 South Throop Street, Chicago, and resides at 4222 North Wolcott Avenue, Chicago.

Lawson, Russell Leslie, C.E., is assistant structural engineer, Montgomery Ward and Company, 619 West Chicago Avenue, Chicago, and lives at 10135 Avenue L, Chicago.

McCauley, Willis J., Arch., is consulting architect, Celotex Corporation, 919 North Michigan Avenue, Chicago, and resides at 1809 East 67th Street, Chicago.

Noren, Delbert P., M.E., is sales engineer, Illinois Engineering Company, 21st Street and Racine Avenue, Chicago, and resides at 1427 Berwyn Avenue, Chicago, Illinois.

Soderholm, Alvin C., M.E., is engineer, Sargent and Lundy, 110 South Dearborn Street, Chicago, and lives at 306 Maple Avenue, Elmhurst, Illinois.

Voita, Eugene, Arch., was married on July 12, 1941, to Szada Hanley in Chicago. The Voitas' residence is at 534 Roscoe Street, Chicago. Voita operates an independent architectural practice from his office at 837 N. Lorel Avenue, Chicago.

Weinswurm, Walter Henry, Ch.E., is metallurgist, Union Special Machine Company, 400 North Franklin Street, Chicago. His home is at 7304 Lunt Avenue, Chicago.

1926

Comfield, Einar A., M.E., is designing engineer, Diamond T Motor Car Company, 4517 West 26th Street, Chicago, and resides at 5519 Henderson Street, Chicago.

Danziger, Alfred J., F.P.E., is state agent for Crum & Forster and has been transferred to Cleveland, Ohio. His home address is 10109 Lake Avenue, Cleveland, Ohio.

Goodwin, Gordon, M.E., is employed as draftsman, Elgin National Watch Company, Elgin, Illinois, and lives at 306 West Chicago Street, Elgin, Illinois.

Hedges, Eugene Clarke, C.E., is supervisor of equipment, Chicago Board of Education, 228 North La Salle Street, Chicago. He resides at 1518 Belle Plaine Avenue, Chicago.

Otte, Karl Henry, M.E., is employed by E. J. Brach & Sons, 1656 West Kinzie Street, Chicago. His home is at 1320 Rosedale Avenue, Chicago.

Wilsdon, Harry D., M.E., is an engineer for the Link-Belt Company, 1116 Murphy Avenue, S. E., Atlanta, Georgia. He is residing at 119 Glenn Circle, Decatur, Georgia.

1927

Beckman, Clifford A., E.E., who is salesman, Visking Corp., 6733 West 65th Street, Chicago, recently was transferred to New York. His home is now at 269 Brantwood, Snyder, New York.

Capouch, Charles, Jr., E.E., is employed at the Western Electric Company, Hawthorne Works, Cicero, Illinois. His home is located at 2116 South Euclid Avenue, Berwyn, Illinois.

Schroeder, William Fred, M.E., who is vice-president, Victor Products Corporation, 2635 Belmont Avenue, Chicago, has recently changed his address to 4823 Balmoral Avenue, Chicago.

1928

Amundsen, George A., C.E., is chief estimator, Chicago Mill and Lumber Company, 111 West Washington Street, Chicago. His home is at 3020 North Karlov Avenue, Chicago.

Hommes, John, F.P.E., recently joined the staff of the Western Actuarial Bureau, 222 W. Adams Street, Chicago. Since 1929 he has served in many capacities for the Kentucky Actuarial Bureau, Louisville, Kentucky. He is married, has a very young daughter and makes his home at 7350 S. Harvard Avenue, Chicago.

Lohner, Carl Leonard, M.E., is an

industrial engineer, Swift & Company, Union Stock Yards, Chicago, Illinois. His home is at 7646 Vernon Avenue, Chicago.

NAFF, ULRICH GEORGE, Ch.E., is employed as an engineer, Peoples Gas Light & Coke Company, 3500 South Pulaski Road, Chicago, and his home is located at 4039 North Avers Avenue, Chicago.

TUCKER, GEORGE LOANE, Arch., recently announced the removal of his office to his new Sauganash residence and studio at 5877 North Kilbourn Avenue, Chicago.

VON GEHR, GEORGE HENRY, E.E., is a partner, Langner, Parry, Card & Langner, Patent Attorneys, 53 West Jackson Boulevard, Chicago, and resides at 140 Park Avenue, Glencoe, Illinois.

1929

CLARK, DONALD B., F.P.E., is instructor of industrial arts, School District No. 13, Milaca, Minnesota, and is residing at Milaca, Minnesota, Box 270.

FORSS, FRITZ V., E.E., has recently accepted a position with the Delta Manufacturing Co., Milwaukee, Wisconsin. His new address is 2650 North 69th Street, Milwaukee, Wisconsin.

FREUNDT, GERHARD L., E.E., is employed by the Sievert Electric Company, 1349 Bauwans Street, Chicago, and lives at 2063 Humboldt Boulevard, Chicago.

GENT, ABEL HERMAN, F.P.E., is associate engineer, Fire Prevention Office, Quartermaster General, War Dept., Washington, D. C., has moved to 29 Johnson Avenue, Hyattsville, Maryland.

GROSS, EDWARD WILLIAM, E.E., is maintenance engineer, Wilson Laboratories, 4221 South Western Boulevard, Chicago. He resides at 3859 West 64th Street, Chicago.

JAY, JAMES, E.E., is assistant engineer, Commonwealth Edison Company, 2233 South Throop Street, Chicago, and resides at 504 North Hamlin Avenue, Chicago.

KANE, LESLIE J., Ch.E., who is research chemist, Heyden Chemical Corporation, Garfield, New Jersey, has recently moved to 337 Paulison Avenue, Passaic, New Jersey.

MIRON (Mironowicz), VLADIMIR C., E.E., is chief engineer, Wincharger Corporation, Sioux City, Iowa, and has recently changed his address to 609 29th Street, Sioux City, Iowa.

PETTERS, GEORGE A., C.E., is staff commodity manager, Johns-Manville Sales Corporation, 22 East 40th Street, New York City, and is residing at Hastings House, Hastings-on-Hudson, New York.

TULAUSKAS, LEONARD, E.E., is an electrical engineer, P. R. Mallory and Company, Washington and Gray Streets, Indianapolis, Indiana. He resides at 104 North Eaton Avenue, Indianapolis, Indiana.

WACK, JAMES E., E.E., is research engineer, Teletype Corporation, 1400 Wrightwood Avenue, Chicago, and lives at 4711 Woodlawn Avenue, Chicago.

1930

BECHTOLD, JOSEPH ARTHUR, F.P.E., has recently been transferred to Hartford, Connecticut, as engineer for The Travelers Fire Insurance Company of Hartford. He is residing at 63 Argyle Avenue, West Hartford, Connecticut.

DUDLEY, BEVERLY, E.E., who is managing editor, Photo Technique and Electronics, McGraw-Hill Publishing Company, 330 West 42nd Street, New York City, New York, completed graduate work in electrical engineering and physics at Columbia University. He is author and editor of "Hand Book of Photography" and "Making Your Photographs Effective." He was married September 15, 1939, and resides at 357 W. 55th St., New York City, New York.

HURLEY, JOHN W., C.E., is operations officer and flight instructor at the U. S. Naval Reserve Aviation Base, Glenview, Illinois. He is on active duty in the U. S. Naval Reserve and has the rank of Lieutenant. With his wife and three children he makes his home at 1909 W. Catalpa Avenue, Chicago.

KUKLIN, ABRAHAM, Arch., who is an architectural designer for Albert Kahn, Architects & Engineers, Inc., Detroit, Michigan, has been married and is residing at 13725 Dexter Boulevard, Detroit, Michigan.

ROHRER, JOHN A., M.E., is sales engineer, Universal Castings Corporation, 5821 West 66th, Chicago, and is residing at 7232 Yates, Chicago.

SITZLER, JOHN B., C.E., who is associate airport engineer, Civil Aeronautics Administration, Atlanta, Georgia, may be reached at 2125 E. 93rd Street, Chicago.

SPENCER, ROLAND M., M.E., is branch manager, Powers Regulator Company, 809 Stuart Avenue, Houston, Texas, has recently moved to 3750 Sunset Boulevard, Houston, Texas.

ZOLAD, JOHN J., Ch.E., who is an engineer for D. Dwight Douglas, 2272 National Bank Building, Detroit, Michigan, is a consultant on protective coatings, dealing with reclamation of sprayed paint coatings. Residence is at 14924 Manor Avenue, Detroit, Michigan.

1931

ABRAMSON, RALPH J., E.E., has recently become an associate engineer, U. S. Engineers, 110 East Garden Street, Rome, New York. His home address is Blossvail, New York.

BOOKER, LEROY W., F.P.E., is designer of water distribution system, Camp Chaffee, Fort Smith, Arkansas. He is residing at 1712 N. B Street, Fort Smith, Arkansas.

HELLSEN, KARL E. W., C.E., has recently become structural engineer, United Engineers and Constructors, Inc., Philadelphia, Pennsylvania. He may be reached at 1043 Rush Street, Chicago.

MYERS, KENNETH HOUSE, E.E., is now an Ensign, U. S. Navy, Naval Air Base, Guantanamo Bay, Cuba. He finished instruction at Newport, Rhode Island, in September and is now a torpedo repair officer.

OTT, STANLEY A., F.P.E., according to information received in the Alumni Office is now with the Ohio Inspection Bureau, 431 E. Broad Street, Columbus, Ohio.

RUTT, FRANK EDWARD, C.E., is associate engineer, U. S. Engineer Office, Louisville, Kentucky, has recently changed his address to 226 North Mt. Holly Avenue, Louisville, Kentucky.

WESTENBERG, JOSEPH EUGENE, Ch.E., is senior process engineer, refining division, Office of Petroleum Coordinator, New Interior Building, Washington, D. C., is now residing at 8101 Hartford Avenue, Silver Spring, Maryland.

1932

BOGOT, ALEXANDER, M.E., is service engineer, Combustion Engineering Company, Inc., 200 Madison Avenue, New York City, New York.

CARLTON, EDWARD WILLIAM, E.E., has his office at 8 South Dearborn Street, Chicago, and is residing at the Evanston Y. M. C. A., 1000 Grove Street, Evanston, Illinois.

JENS, CHARLES JOSEPH, F.P.E., who is special agent for the Great American Group of Fire Insurance Companies, was married early in September to Mono F. Pickard of Milwaukee. Temporary residence is at the Astor Hotel, Milwaukee, Wisconsin.

KORRELL, PHILIP H., E.E., has recently been made chief inspector, Soreng-Manegold Company, 1901 Clybourn Avenue, Chicago. His home address is 213 27th Avenue, Bellwood, Illinois.

MUELLER, ARMIN J., F.P.E., is state agent, America Fore Group of Insurance Companies, 204 South Jackson, Jackson, Michigan. His home address is 110 West Golf Street, Jackson, Michigan.

SCHULTZ, WILLIAM G., F.P.E., who is engineer for Lumbermen's Mutual Insurance Co., Mansfield, Ohio, has forwarded to the Alumni Editor the accompanying picture of his talented daughter Diana Jeanne who is well on her way to success in Hollywood. She is to appear with Walter Huston and Kay Francis in a forthcoming Warner Brothers picture, "Always in My Heart." Her stage name is Patty Hale. Look for her when you see this picture.

Welborn-Warner Bros.—Copyright

YOST, WILLIAM L., E.E., who is a salesman, H. J. Heinz Company, 342 North Western Avenue, Chicago, has changed his address to 2104 Fremont Street, Rockford, Illinois.

1933

BUSH, FRANK LEWIS, Arch., who is a tool and die designer, Illinois Tool Works, 2501 North Keeler, Chicago, is the proud father of a daughter born August 27, 1941, at Highland Park. His home address is 1514 North Clifton Avenue, Chicago.

JANSSEN, WILLIAM A., Arch., has recently become research engineer for the Celotex Corporation, 919 North Michigan Avenue, Chicago. His home address is 222 North Mason Avenue, Chicago.

NELSON, CLIFFORD A., F.P.E., who is special agent, Home Insurance Company of New York, 1800 Buhl Building, Detroit, Michigan, has recently moved to 14595 Terry, Detroit, Michigan.

WINOGROND, MILTON J., Ch.E., has recently moved to 216 North George Mason Drive, Arlington, Virginia.

1934

ANDERS, ARCHIE, M.E., is temporarily employed as mechanical engineer, War Dept., First National Bank Building, Minneapolis, Minnesota. For mail: 4750 N. Maplewood Avenue, Chicago.

Landwer, Donald F., E.E., is Minister of the First Evangelical Church, Ontario and Marion Streets, Oak Park, Illinois. He is residing at 1110 Ontario, Oak Park, Illinois.

McDonough, Edward William, M.E., who was heating and ventilating engineer, Douglas Aircraft Co., passed away on October 5, 1941.

Sachs, Carl Herman, Jr., F.P.E., has recently been made special agent-engineer, National Fire Insurance Company, 828 North Broadway, Milwaukee, Wisconsin. His home address is 3054 North Farwell Avenue, Milwaukee, Wis.

Spangler, Charles D., C.E., in a letter to President Heald under date of October 28, 1941, from Lafayette, Louisiana, said, in part, as follows:

Dear Mr. Heald:

It seems like a long time since the summer of 1931 when I was a student in the surveying camp in northern Wisconsin and you were one of the teaching staff. Lots of things have happened since then and especially to Armour Tech. Congratulations to the new Illinois Institute of Technology! The Chicago area needs a good technical school and with the necessary funds and backing Illinois Tech can fill the bill.

I have been too busy and too far away to visit Chicago very often the last few years but on my next trip I will certainly spend some time looking over the rejuvenated Armour Tech. That will probably not be until next summer since I am at present public engineer with the U. S. Public Health Service and assigned to the Louisiana State Health Dept. It is some little distance from Lafayette, Lousiana, to Chicago.

It might interest you to find out what has happened to one of your former students. I'll make it brief. When I graduated in 1934 there wasn't exactly a boom in civil engineering and since bacteriology interested me, the result was an M.S. in Bacteriology from the Illinois University College of Medicine in 1936. During that time I worked a year as a research bacteriologist for Procter and Gamble. In 1936 after the research problem was completed I was fortunate to become a district sanitary engineer with the Illinois State Health Dept. The following three years taught me a great deal about water and sewage plants, industrial wastes, stream pollution, and similar problems. In 1939 after deciding that more schooling would be advantageous and being lucky enough to obtain a research fellowship at Yale University, I resigned and went back to school to work for my doctorate in public health. The residence requirements and the research were completed last spring and I hope to submit my thesis next June. Last spring I received a civil service appointment as an associate public health engineer in the Public Health Service. Now I am acting southwest regional engineer with the Louisiana State Health Dept.

It is easy to design and construct a water or sewage plant but sometimes it is harder to operate it and get the desired results. I start in where many engineers leave off, in the operation and maintenance. What I am learning should make me a good designing engineer one of these days.

Some day I would like to teach either sanitary engineering, sanitary bacteriology, or the principles of public health as they apply to the sanitation of the environment. Would also like to do some research work on industrial wastes, because it is the biggest problem in the sewage disposal field. Meanwhile I'm learning more every day and realizing that it is impossible to know any subject completely.

I haven't been getting any Institute publications lately, so I guess the Alumni office has lost track of me. Getting more schooling and maintaining a family keeps the pocketbook rather flat but perhaps I can find enough for an annual contribution from now on and do that much to help build up a really great Illinois Institute of Technology.

With best wishes, I am,

Sincerely,

CHAS. D. SPANGLER.

Svoboda, Emil Anton, M.E., who is district representative, Ampco Metal, Inc., Milwaukee, Wisconsin, has recently been transferred to Cleveland to take charge of the Cleveland district for this company, 71st Euclid Building, Cleveland, Ohio. He resides at 19640 Lake Shore Boulevard, Cleveland, Ohio.

1935

Aschoff, Everett W., M.E., who is tool design draftsman for International Harvester Company, 201 W. First Street, Rock Falls, Illinois, has recently changed his address to 701 Locust Street, Sterling, Illinois.

Davidson, Lawrence Whitney, Arch., is architect, American Can Company, and has been transferred to the plant at 230 Park Avenue, New York City, New York. He has moved to Fort Hill Terrace, Scarsdale, New York.

De Boo, Joseph H., M.E., who is with the International Harvester Company, tractor works, has recently changed his address to 3222 Park Avenue, Brookfield, Illinois.

Olson, Harold, C.E., is serving as assistant civil engineer, Civil Aeronautics Administration, Dept. of Commerce, Stanley Horner Building, Washington, D. C. His duties include the design and construction of airports. His home is at 7819 Eastern Avenue, N. W., Washington, D. C.

Petraitis, Albert, E.E., is a student engineer, General Electric Company, Schenectady, New York, and is now residing at 17 Front Street, Schenectady, New York.

Roberts, John Llewellyn, F.P.E., according to information from Milwaukee alumni is now a special agent for the Federal Bureau of Investigation and is stationed at Quantico, Virginia.

Sims, Stanley, M.E., is construction engineer, Barrett Company, 2800 South Sacramento, Chicago, has recently changed his address to 4807 South Kedvale Avenue, Chicago.

1936

Alderman, Jerome C., C.E., writes he was called into service on August 16, 1941, with the 7th Zone constructing quartermaster and assigned as the engineer officer for Arkansas ordnance plant, Jacksonville, Arkansas.

Doede, Homer O., E.E., has recently moved to 425 W. 74th Street, Chicago.

Scott, John Corrie, C.E., is salesman, Powers Regulator Company, 2720 Greenview Avenue, Chicago, and has recently moved to 6816 Oglesby Street, Chicago.

1937

Endert, Kenneth G., C.E., is engineer, Northern States Power Company, 15 South 5th Street, Minneapolis, Minnesota, and has recently changed his address to 3735 Harriet Avenue, Minneapolis, Minnesota.

Franzen, Raymond Paul, M.E., was married to Alyce Larson on September 6, 1941. He is development engineer, Johnson Suture Corporation, and resides at 2950 West 60th Street, Chicago.

Gerber, Norton, E.Sc., is an instructor, U. S. Cartridge Company, 3000 Locust Street, St. Louis, Missouri, and is residing at 3850 Labadie Avenue, St. Louis, Missouri.

Gunther, Wilbert, F.P.E., was married to Miss Kathryn Bell on June 28, 1941, in Columbus, Ohio. Residence is at 4606 N. Hermitage Avenue, Chicago. Gunther is in the Western Engineering Department of the Springfield Group of Insurance Companies.

Shewchuk, Michael, E.E., is assistant safety engineer, U. S. Naval Torpedo Station, Newport, Rhode Island. He resides at 112 Lake Erie, Newport, Rhode Island.

Winkler, Richard Edward, F.P.E., was appointed special agent-engineer for the Firemen's Fund Group of Insurance Companies in the northern Ohio field. His office is 878 Union Commerce Building, Cleveland, Ohio. He was formerly with the Ohio Inspection Bureau at the Lima, Ohio, branch office and before that with the Fire Underwriters Inspection Bureau, Minneapolis, Minnesota. He was married late in November to Miss Dorothy Jennings of St. Paul, Minnesota. Residence is to be in Cleveland, Ohio.

1938

Baker, David, Arch., has been awarded an architectural scholarship at Harvard University and is now in residence there. Baker, while at the Institute assisted in the layout of this magazine.

Burgweger, Leonard, Arch., is superintendent, Bireley's Beverages, 5230 North Milwaukee Avenue, Chicago, has recently

moved to 893 Willow Road, Winnetka, Illinois.

Chilgren, William J., M.E., is supervisor, Remington Arms Company, Inc., Lake City, Missouri. He was recently transferred from their Bridgeport plant. His home address is 305 North Delaware Street, Independence, Missouri.

Eng, Gan Beck, Ch.E., is development engineer, Joseph E. Seagram & Sons, Inc., Lawrenceburg, Indiana, and is now residing at 2627 Highland Avenue, Cincinnati, Ohio.

Gamson, Bernard W., Ch.E., is research assistant, University of Wisconsin, chemical engineering department, Madison, Wisconsin. His home address is 120 North Orchard Street, Madison, Wisconsin.

Henderson, Andrew Benjamin, E.E., who is inspector, signal corps equipment, aircraft radio laboratory, Wright Field, Dayton, Ohio, states that he has been transferred from inspection duty at Western Electric Company, Kearny, New Jersey to Pioneer Gen-E-Motor Corporation. His home address is 2757 Wilson Avenue, Chicago.

Marsch, Nicholas John, Jr., C.E., is employed by S. A. Healy Construction Co., Chicago, for Panama Constructors and is en route to Cocoli in the Canal Zone.

Morrill, Albert Reynolds, E.E., who is junior electrical engineer, National Advisory Committee for Aeronautics, Langley Field, Virginia, is now residing at 75 Linden Avenue, Hampton, Virginia.

O'Brien, William Paul, M.E., was married July 5, 1941, to Miss Louise O'Brien of Chicago. His home address is 6745 Emerald, Chicago.

Thodos, George, Ch.E., is research assistant, University of Wisconsin, chemical engineering department, Madison, Wisconsin. His home address is 120 North Orchard St., Madison, Wisconsin.

Underwood, William M., Ch.E., is senior analyst, General Chemical Co., Baltimore, Maryland. He is married and resides at 1742 E. North Avenue, Baltimore, Maryland.

1939

Gilbert, Allan W., F.P.E., is an inspector for the Kentucky Actuarial Bureau, Citizens Savings Bank Building, Paducah, Kentucky. He was recently married and resides at the Madison Apartments, 7th and Madison, Paducah, Kentucky.

Henriksen, Paul Frederick, M.E., was married to Geraldine Claudia Trimble on May 10, 1941. Home address is 1500 North Mason Avenue, Chicago.

Hollenbeck, Fred D., M.E., is engineer, Kimberly-Clark Corporation, Neenah, Wisconsin, and is residing at 315 Clark Street, Neenah, Wisconsin.

Jahnke, Fred G., M.E., was married to Miss Louise Roeschlein on October 11, 1941. He is going with the U. S. Navy on November 17th as an Ensign.

Johannisson, Ernst Eric, M.E., is tool inspector, aviation engine plant, Buick division, Manheim Road and North Avenue, Melrose Park, and is residing at 1920 North Talman Avenue, Chicago.

Kirz, Benjamin, C.E., who is junior civil engineer, U. S. Army, War Dept., Louisville, Kentucky, was married on April 27, 1941, to Miss Beatrice Lutz. His home address is 3620 West Vermont Avenue, Louisville, Kentucky.

Lawrence, Sigmund J., Ch.E., is a coal research fellow, State University of Iowa, Iowa City, Iowa. His research problem is concerned with coal washing. He has been married for over a year and resides at 15 West Harrison, Iowa City, Iowa.

McCormack, John B., E.E., is electrical designer and draftsman, Harza Engineering Company, 205 West Wacker Drive, Chicago. He resides at 10357 South Hoyne Avenue, Chicago, Illinois.

Olson, Elmer H., C.E., is employed by S. A. Healy Construction Co. of Chicago, for Panama Constructors. He is located at Cocoli in the Canal Zone.

Pater, Anton Stanley, Ch.E., is research chemical engineer, The Presto-O-Lite Company, 16th & Main Streets, Indianapolis, Indiana, and was married on October 4, 1941, to Miss Vivian E. Pelant of Berwyn, Illinois. He has recently moved to 2216 North Talbott Street, Indianapolis, Indiana.

Rickmeyer, E. Walter, M.E., who is director of research and development, Jefferson Electric Company, Bellwood, Illinois, is now residing at 216 Indiana Avenue, Elmhurst, Illinois.

Schwartz, Hyman, M.E., is heating engineer, Home Gas Industries, Inc., 122 South Michigan Blvd., Chicago. He has been married for three years and has a son, Allen Burton who was born on May 6, 1941. He resides at 1811 South St. Louis Avenue, Chicago.

Thomas, G. W., Ch.E., has been employed by The Wood Conversion Company, Cloquet, Minnesota, as a chemical engineer, since August, 1941. He has changed his address to 217 Avenue E., Cloquet, Minnesota.

Utril, George L., C.E., who is an architectural engineer, Board of Education of Chicago, 228 North La Salle Street, Chicago, is now residing at 5530 North Neenah Avenue, Chicago.

Van Alsburg, Earl R., M.E., who is tool designer, LaSalle Designing Company, 630 West Lake Street, Chicago, has recently changed his address to 10927 South Halsted Street, Chicago.

Zarem, A. M., E.E., who is an assistant, electrical engineering department, California Institute Technology, was married on October 1, 1941, to Miss Esther Moskowitz, and is residing in Pasadena, California.

1940

Bigos, Casimir Lucien, Ch.E., is now an Ensign, Ordnance Dept., U. S. N. R., U. S. Navy, Washington, D. C. His home address is 5123 Medill Avenue, Chicago.

Black, Sydney D., M.S., is junior engineer, propeller laboratory, material division, Wright Field, Dayton, Ohio, Army Air Corps, resides at the Y.M.C.A., Dayton, Ohio.

Cade, William M., C.E., is instructor, department of mathematics, University of Hawaii, Honolulu, T. H., has recently changed his address to 2013 Hunnewell Place, Honolulu.

Cariotto, Edward, E.E., has recently been employed by the Illinois Testing Laboratories, Inc., 420 North La Salle Street, Chicago, as an electrical engineer. Home address is 4228 North Harding Avenue, Chicago.

Dorr, Thomas Wesley, Ch.E., is employed by the Eastman Corporation, Kingsport, Tennessee, and is at present living at 1522 Waverly Road, Kingsport, Tennessee.

Harding, James F., C.E., is an instructor in civil engineering, Texas Technological College, Lubbock, Texas.

Humphrey, William W., Ch.E., who is junior engineer, National Aniline & Chemical Company, 1051 South Park Avenue, Buffalo, New York, has recently moved to Meadow Lane, Angola-On-The-Lake, New York.

Leland, Raymond L., C.E., is district sanitary engineer, Department of Public Health, 404 Smith Building, Freeport, Illinois. He was married on June 15, 1941, to Miss Nona Keno of Chicago. Residence is 11½ North Van Buren, Freeport, Illinois.

Meigs, Douglas P., M.S., who is chemical engineer, Gelatin Products Company, Detroit, Michigan, writes that he is designing and building a plant for the manufacture of synthetic vitamins and fine chemicals. His home address is 14294 Hampshire Avenue, Detroit, Michigan.

Michka, Steve Max, E.E., is test engineer, Jefferson Electric Company, Bellwood, Illinois. He is residing at 1908 S. Christiana, Bellwood, Illinois. He writes that Charles Tuma '36, E.E., was married a few months ago. He is also employed at Jefferson Electric as assistant electrical engineer.

Natinchek, Nicholas Alexander, Ch.E., who is sales assistant, Socony Vacuum Oil Company, 59 East Van Buren Street, Chicago, has recently changed his address to 1905 South Sawyer, Chicago.

Newman, Henry F., Ch.E., is engineer for the Standard Oil Company of Indiana, Whiting, Indiana, and resides at 712 Cornelia Avenue, Chicago.

Prather, Fred H., Arch., who is an architectural inspector, Graham, Anderson, Probst & White, Borinquen Field, Puerto Rico, writes that he is working on the U. S. Army's No. 1 Caribbean Air Base. His home address is 559 Sur[illegible] Street, Chicago.

Quandee, H. B., F.P.E., is with the Associated Factory Mutual Fire Insurance Company, 184 High Street, Boston, Massachusetts. His residence is Huntington Avenue Branch, Boston Y. M. C. A.

Rees, Kenneth A., Ch. E., who is research assistant, Armour Research Foundation, is residing at 3254 South Michigan Avenue, Chicago.

Scherer, William H., was married to Miss Jane Elizabeth Latshaw on June 21, 1941. Residence is at 736 North Washington Street, Naperville, Illinois.

Struchell, Conrad E., Ch.E., is chemical engineer, Curtiss Candy Company, 622 Diversey Parkway, Chicago, and resides at 2031 Summerdale, Chicago.

Wagner, Richard J., Sr., Ch.E., is chemist for Lennon Wall Paper Company, 1007 4th Avenue, Joliet, Illinois. His home address is 7108 S. Normal Boulevard, Chicago.

1941

Burns, William Francis, M.E., is an instructor of aircraft mechanics, Chanute Field, Illinois. He has completed the Air Corps technical school with an air mechanics rating. For mail: 3019 Keele Street, Chicago.

Davis, Jack Edward, M.E., is mechanical engineer, testing aircraft engine U. S. Army Air Corps, Central Procurement District, Ford Motor Company, Dearborn, Michigan. He is residing at 1974 Gladstone, Detroit, Michigan. He writes that Henry Dulkin, M.E., '41 also with the same company and has just been married and that Peter Gianir[illegible] M.E., '41, is with the Air Corps at Continental Motors.

De Money, Fred William, F.P.E., has been employed by Kimberly-Clark Corporation in the staff engineering department, Neenah, Wisconsin. He writes that six other Armour men are employed there, namely: Roy Jacobsen, Peter Link, E. [illegible] Weitzull, Eric Isaakson, Bob Olson and

Chuck McAleer. He also states that five of them have rented a house and are living together in the best of fashion at 136 River Drive, Appleton, Wisconsin.

HEIDENREICH, FRANK J. JR., M.E., is employed by Foote Bros. Gear & Machine Corporation, 4545 S. Western Avenue. Chicago, as assistant plant engineer. His home address is 6 West Burlington, Clarendon Hills, Illinois.

LARINOFF, MICHAEL W., M.E., is designing engineer, J. I. Case Company, tractor manufacturers, Rock Island, Illinois. He is residing at 909 22nd Street, Rock Island, Illinois. He is attending Augustana College evenings.

LINK, PETER J., M.E., is design engineer for Kimberly-Clark Corporation, Neenah, Wisconsin. He is residing at 402 Racine Street, Menasha, Wisconsin.

MUELLER, ROBERT L., Ch.E., is chemist, E. I. Dupont DeNemours & Company, Jackson Laboratory, Deepwater, New Jersey, and resides at 16 Van Meter Terrace, Salem, New Jersey.

PRANE, ZENON MICHAEL, Ch.E., is a naval inspector of ordnance, U. S. Navy, 102 B Street, N. E., Washington, D. C. He writes he is undergoing a training program and will be given an assignment in October, 1941. He also states with him are H. Sliwa, R. Parkin, E. Majka and C. Bigos, all of Armour. They were stationed at Fort Schuyler in Bronx, New York, for two months previous to the training program. His home address is 4921 South Avers Avenue, Chicago.

RANSOM, FRANCIS A., M.S., Who is production engineer, Lockheed Aircraft Corporation, Burbank, California, has recently moved to 238 San Fernando, Burbank, California.

WINGET, WILLIAM FULTON, E.E., who is with the Public Service Company of Northern Illinois, has been transferred from the operating department, Bellwood substation to the production department, Station 6, Waukegan, Illinois. He is residing at 412 E. Lincoln Avenue, Libertyville, Illinois.

AIRPORT TRAFFIC

(From page 7)

pathology, there is an exacting examination for color blindness and also for depth perception, or the correct gauging of distances by sight.

Before the operator may take the final examination, he must have served as a junior operator for six months. A junior operator must have at least a year's experience before he can attempt even a junior examination. The junior operator maintains the records and makes all telephone contacts with the government control-station and obtains the airway clearances from that organization. He may control traffic when it is not heavy, and then only when under the supervision of a senior, or fully licensed operator.

In addition to controlling traffic, the operator is called upon to assist pilots in many ways. All pilots are warned of obstructions which may develop, such as construction work on the airport or in the vicinity. Sudden changes in weather, such as storms, changes in visibility, or ceiling are also announced. A new pilot, such as an itinerant, proceeding to the airport, may become lost, and by means of a description of prominent objects, such as canals, lakes, hills, large buildings, etc., which he furnishes to the operator, may enable the operator to guide him to the airport. A pilot may be in difficulty and need assistance in landing under emergency conditions. All other traffic is suspended, the planes in the air are instructed to circle, and those on the ground are held there until the pilot needing assistance has landed safely. In case of accident, or impending accident, the police and fire departments are called by private wire; they respond immediately with an ambulance and other equipment necessary.

Many people form their impressions of the control of airplane traffic from motion pictures or radio programs and from the exciting descriptions in fiction. The situation is, however, vastly different; pilots calmly report positions and are as calmly given instructions. In fact it is difficult to appreciate that this exchange of information is being given to and received from airplanes traveling through the air at speeds up to two hundred and fifty miles per hour. The ordinary exchange of reports and instructions may proceed somewhat as follows:

United 29. "United Flight 29 calling Chicago Tower over Gary at three thousand. Go ahead, please."

Chicago Tower. "United 29 from Chicago Tower. Over Gary at three thousand. The wind is West nine. Land West. An inbound Army P36 reported Gary at two thousand and an inbound TWA just reported Whiting at three thousand. There is also an inbound American this side of Lansing descending from twenty-five hundred, following an inbound Navy. An Eastern just took off climbing to five thousand at Lansing. Go ahead United 29."

United 29. "United 29 answering Chicago Tower. I see the P36 and will follow him."

Chicago Tower. Chicago Tower to Army P36 Number 8249. Do you see the inbound TWA Douglas?"

Army P36. "Army 8249 to Chicago Tower. Yes, right ahead."

Chicago Tower. "Army 8249. Please follow TWA."

TWA 23. "TWA 23 to Chicago Tower. I see the American ahead of me, following the Navy ship. Shall I follow him?"

Chicago Tower. "Chicago Tower to TWA 23. Yes, Please follow American."

This type of conversation continues, including possibly an inbound PCA from the Northeast and Northwest Airlines from the Northwest, which are made to fit in with the other traffic as it approaches the field. An outbound Chicago & Southern or Braniff would possibly take-off on a parallel runway.

When difficulties are encountered, the same cool atmosphere prevails. This is particularly brought out by incidents such as the following:

During a busy morning rush of traffic, included in the incoming traffic was a privately owned twin-motored Beechcraft with retractable landing gear. As his turn for landing arrived the pilot, instead of landing, continued on over the airport. He immediately called in and stated that his wheels could not be completely lowered. The operator suggested that the plane make a low pass over the field in order that he might closely observe the position of the wheels. It was found that one was lower than the other. A mechanic, well acquainted with this type of aircraft, was summoned, and he observed closely as two more low passes were made over the field, with no better results. An airline pilot, doing practice work in the vicinity, overheard the conversation and volunteered his assistance. The traffic was cleared for him to land, and picking up the mechanic he took off. The pilot in the first ship raised and lowered his wheels while the pilot in the second ship with the mechanic, flew just below him. Through instructions, relayed by the operator from the mechanic to the pilot in distress, he finally succeeded in lowering the wheels properly, after which a safe landing was effected.

Another incident of interest occurred when an army pilot took off with an extra passenger clinging to the outside of the rear cockpit. The unwilling stowaway had climbed up onto the airplane to give some final instructions to a passenger, when the pilot, unaware of this, took off. Rather than be struck by the tail of the airplane, the extra passenger clung to the back portion of the rear cockpit. Immediately after take-off the army hangar called the operator on the telephone and informed him of what had happened. The pilot was immediately called and was cleared

to land, while all other traffic was suspended. A safe landing was made.

The training received by the control tower operator proves of decided advantage when incidents such as these occur, so that pilots have become accustomed to placing complete confidence in the operators; this promotes efficiency of operation and safety.

Safety at all times, twenty-four hours of the day, is the watchword of pilots and control men, with the result that aviation has grown from a hazardous occupation to one of the safest modes of travel. It has been found by insurance statisticians that it is far safer to ride on a transport airplane than to ride in the family automobile. The United States Government, through the Civil Aeronautics Administration, is coming to the aid of airport control to further improve its fine record of safety and efficient operation. It is expected that, within a few months, all airport control, as well as airway control, will be combined in one unit This movement has the cooperation of the pilots and the airports.

RESEARCH IN M E.

(From page 10)

this out. The first observation of flowing steam showed that the light from the moisture droplets was blue, and also polarized. This discovery led to a study of photography and photo-elasticity. The fact that the velocity of the steam was greater than the velocity of sound led to a study of the available means for measuring supersonic velocities, and this in turn led to an investigation of the impact tube in high-speed streams.

In conclusion, it should be pointed out that the members of the M. E. Department have had the able assistance of men from other Departments in the Institute who have contributed papers to the publications of the American Society of Mechanical Engineers. As a typical example, at the 1941 annual meeting of the Society, Dr. Donnell's paper on plastic flow was presented at the same session as a paper on cavitation erosion, by Dr. Thomas Poulter of the Armour Research Foundation. At an earlier session Dr. C. O. Harris, of the Department of Mechanics, spoke on the dynamic properties of rubber. Thus, the breadth of mechanical engineering is great enough to include the activities of specialists in many

CLASSIFIED ADVERTISEMENTS

subjects. Research in Mechanical Engineering will continue to be supported at Illinois Institute of Technology, not only because it is the function of the Institute to extend human knowledge, but also because advanced study acts as a catalyst in the complex reaction which ensues when students and teachers are brought together in the favorable environment afforded by a progressive school of engineering.

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PLASTICS

(From page 17)

plastic products, even without any reference to the present emergency, which has further complicated the picture because it has affected the plastics industry just as it has every other industry. There are two factors to the cost problem: material cost, the primary expense; and the molding cost. Formerly the material cost determined the ultimate cost, because molding expense was more or less constant. Injection molding, however, drastically reduced molding expense. The reason is that with the injection process the output, in terms of units, is much greater, and the operation of the machines is semi-automatic. Hence the cost of the finished product has been substantially reduced, because despite the relatively high material cost, the molding cost is substantially less. Furthermore, greater volume enabled the manufacturers of injection materials to reduce their costs thus effecting another economy in production of injection-molded parts. Basically the relationship of the injection-molding machine to the compression-molding machine is the same as that of the automatic printing press to the rocker-type printing press, which has to be fed by hand. And the relationship of their operating costs is parallel.

"How large can a molded piece be?" is a question one often hears from men who are interested in turning to plastics for their products. This question is somewhat like the question, "How fast can an airplane fly?" There is no theoretical or practical limit to the size of plastic pieces. Right now, they are limited to their present size simply by the size of the present presses. Even this generalization is not always valid; it was reported to this writer several years ago that one European manufacturer had made an entire casket by using ordinary molding material, and substituting duration of heating time for amount of pressure applied. Such innovations are diffcult because of the expense of experimentation involved; but once proved sound, they may well revolutionize the industry again.

From the standpoint of size, as well as from other considerations, one of the most challenging molding problems a designer ever worked on was that of a molded plastic wheel, the central part of a new kind of filing machine invented by a Chicago insurance broker. Two feet in diameter, with a peripheral surface eight and three-fourths inches, and weighing fifteen pounds, this is one of the heaviest pieces ever molded. The inventor had discovered that a die-casting would be prohibitively heavy, and very expensive; and that a stamping would have been far too expensive, even if it were feasible—which was doubtful. He decided to try plastics. In conjunction with the molder, a scheme of molding the wheel in two halves—each of them with seven brass inserts as well as a one-inch axle-tube insert—and assembling it, was worked out. Here was a case where a molded plastic was indicated, not only because it was cheapest, but because within the limits of practicality it was the *only* material which could have been used successfully.

Again, that piece would have been virtually impossible a few years earlier. But advances in engineering knowledge, together with innovations in molding technique, plus improvement in the molding material itself, made the impossible a fact. The plastic industry is like that.

AUTOMOTIVE

(From page 19)

A case in point was the matter of providing armor plate for many of the vehicles. Immediate investigation disclosed that the entire output of all the existing facilities in this part of the country were engaged for months ahead, so it became necessary to make our own arrangements. This was done by obtaining the co-operation of a local saw manufacturer in the erection of a new building, with tempering ovens large enough to handle the large and heavy steel plates needed in our production.

This problem solved, there arose the necessity of building our own proving range where each "heat" of armor plate could be tested for its resistance to penetration before fabrication was begun. A staff of our engineers visited the government proving grounds at Aberdeen, Maryland, and with the wholehearted co-operation of the Government engineers there, drew up the plans for our firing tunnel, duplicating the Aberdeen facilities in every important detail. Erection of this building, a hundred yards long, with thick walls, was started at once and completed within sixty days.

The company has always maintained rather extensive testing grounds where the performance of each new type of vehicle is tested for its ability to operate in deep sand, in mud and snow, and over abnormally steep grades. Under military production, however, with our output vastly enlarged, and the contract requirements calling for the testing of each unit before delivery, it became necessary to find additional testing grounds. There were located on the estate of one of our officials in the extremely rugged country found, in Indiana, only in Brown County. There, new courses were laid out and tests are proceeding every day in the week.

These are but a few of the problems encountered in the transition of our plant to all-out defense production. We are solving them as they come along, and will continue to do so, successfully, we hope, until the happy day when the world gets back on an even keel.

RELAYS

(From page 23)

A glance at last year's statistics gives a good impression of the magnitude of the meet; it has been growing year by year. Late entries in 1941 brought the total number of contestants to 550 from some forty-three colleges and universities in the States of Illinois, Wisconsin, Minnesota, Michigan, Iowa, South Dakota, Missouri, Kansas, and Nebraska. These athletes competed in two classes, according as their schools are in the college or the university division.

The name of the Games was changed last year, with the merger of Armour Institute of Technology and Lewis Institute. The Games are now called THE ILLINOIS TECH RELAY GAMES; the old name was Armour Tech Relay Games.

For sheer audacity at record breaking, The Games prove every year to be surprising. Record holders and event winners, coming back for another try at the marks, find new and better opposition each year.

Little Gene Littler of Nebraska for two years has been beating the dash men in the 70-yard sprint. In 1941 he won the 440-yard event with a record-breaking sprint. Bill Williams of Wisconsin, current indoor record holder of the Big Ten pole vault, went down to defeat at the hands of youngsters of Northwestern University and the University of Chicago. In the hurdle events Robert Kahler of Nebraska took perennial winner Charles Horvath of Northwestern into camp.

The real drawing power of the games is illustrated in the brief summary noted above. Athletes of the various conferences, in competition during the preceding weeks have labored hard and long to establish records; then, during the last indoor meet of the season, the best men from the conference meet in Chicago to pit their wares against each other.

ALEXANDER SCHREIBER

SCHOOLMASTER

(From page 24)

boys are not in uniform, but their work is diverted, one almost says perverted, from the ends that they had planned. They are building tanks, warplanes, devices designed to kill, or devices meant to protect them and us from the killers.

We are engineers. Therefore we detest waste. And the waste of war repels us. We might say that we have a professional abhorrence for the pouring out of material and the destruction of men and women and children; and this abhorrence is in addition to the instinctive revulsion which we feel in common with all other men of good will. But we are not pacifists, and we will not tolerate that label. Militarists? Of course not. It would be simple, and simply absurd, to say that a man must have one or the other of these two tags. What then? What should we do? Is our work wasted? Can we retain any rational philosophy of life and work? Shall we curse the authors of the insane drama and, with our arms folded, watch the world go to hell?

Who *are* the authors? We can discuss this or that treaty, that or the other diplomatic exchange, one or many errors, omissions, or stupidities. After it all we can say that the bloodguilt is not ours. The tragedy is here, but it is not of our seeking. Our boys are warriors and armorers; it must be so. We love them and we suffer with them, but to save their own souls, to save everything that we have lived for, they and we must see this thing through.

Easy to say this? Sheer rhetoric? Bombast from a man beyond military age and thousands of miles from an armed enemy? We schoolmasters have sons,—sons of the blood, and those others whose intellect and character we have helped to form. And we want, more than we can express, to do what our sons need and ask for. It is some consolation to know that our situation makes it possible for us to do at least a part of what needs doing. We do not now discuss the doings of the statesmen,—this is not the place for critical comparison of educational systems, for discussion of the merits of various curricula. Our job is to be engineers, because in this bewildered crisis we know that the only route to safety will be by roads that we must build, and by engines that we must contrive and operate. Never before have energies controlled by men been so destructive to men. Our profession, our training, our whole system of thinking makes us the group that must use these energies completely, efficiently,—directing them against the enemies of our lives and of our peace.

The schoolmaster and his brethren and their sons, of the body and of the mind, in uniform and out, are Americans. Is it presumptuous to say further, as though it were of vital importance, that they are American *engineers*.

FINANCING

(From page 27)

in the main from the wealthier part of the population and from business firms. The business firms are largely owned by the wealthier part of the population, so whatever the taxes are assessed, it is the wealthier part of the population that pays the taxes. Most of the government bonds are owned by the wealthier people. So, although these people would have fought cancellation of the bonds even to the point of replacing the incumbent administration, they will pay taxes which immediately return to them to buy the bonds, which are then torn up.

Looking at the whole country, there is little actual difference between repudiation and increased taxes to pay the bonds. Also, looking at the whole picture, there is little difference between higher taxes during the war and borrowing followed by repudiation after the war. In other words, the three methods of raising money to use in markets to divert production from consumers to war industries are not very different when the total picture is examined. The words are different and the American public has always showed an ability to swallow unpalatable economic expedients if they are only dressed in the right words.

There are also, of course, differences in detail. The fact that one man is twice as rich as another does not guarantee that he will own twice as many bonds or pay twice as much taxes. There will be some reshuffling of purchasing power in the fiscal machinations employed to redeem bonds long after the war is over. But the total purchasing power remains unchanged and it remains largely in the same hands. Thus, even from a monetary point of view, it is hardly correct to insist that the cost of a war is borne by succeeding generations.

IV.

This article is limited to a consideration of the economic aspects of the cost of the war. However, it seems only proper to conclude with a short acknowledgment of non-economic factors. To the extent that a war lowers morale, increases crime and irresponsibility, produces a feeling of insecurity which results in less motivation to production, and otherwise causes psychological and sociological difficulties, future generations are indeed burdened by the psychic costs of war.

BOOK SHELF

(From page 34)

tural assertion (form, a public matter that symbolically enrolls us with allies who will share the burdens with us). The ridiculous, on the contrary, equips us by impiety, as we refuse to allow the threat its authority. We rebel, and courageously play pranks when "acts of God" themselves are oppressing us. . . .

Such, in brief, is Burke's theory of literature. It is consistently functional. In his view, the process of literary creation has, like all human activities, the function of perfecting man's adjustment to his environment. This it may do either by making him acquiesce in what is or by fitting him to struggle for something better. It is good insofar as it has survival values for the poet and his audience.

SANFORD B. MEECH

Static Electricity. National Fire Protection Association, Boston, 1941.

This fifty-page pamphlet is packed with information and recommendations about the prevention of fires in which the igniting agent is a spark discharge of static electricity which has accumulated as a result of separation of materials, friction, or similar cause. Fire protection engineers recognize that many serious fires and explosions, and considerable loss of life, have been caused in this way, and a large amount of research has been devoted to the subject. Although the results of this research have been made available in various publications, this pamphlet is the first which covers the problem in a comprehensive way.

For the initiation of combustion, three conditions are necessary: first, the presence of combustible material; second, a supply of oxygen, usually from the air; and third, a means of raising the temperature to the ignition point or kindling point of the fuel. In many cases, the existence of the first two conditions is unavoidable. The present discussion relates to means of preventing the third, by preventing the disruptive discharge of electrical energy as a spark.

The number and variety of processes and equipment in which static electricity may be a hazard is suggested by a partial list of sections in the text.

Storage and Handling of Flammable Liquids.

Coating, Spreading, and Impregnating.

Transmission Machinery.
Fibres and Dusts.
Mixing, Grinding, Screening, and similar operations.
Discharge of Gases and Vapors.
Dry Cleaning and Dry Dyeing.
Printing and Lithographing.
Operating Rooms.

In discussing the prevention of fires and explosions, it is predicated that the generation of static can not be prevented, and that it is not practicable to attempt to do so. The basic principle is to permit dissipation of the charge before it reaches such potential as to be discharged as a spark. To accomplish this result, the effective procedures are interconnection or electrical bonding of parts which tend to assume different potentials, and adequate grounding of the interconnected system. In some circumstances, within doors, where control of atmospheric moisture is practicable, establishment of high relative humidity may reduce or eliminate the hazard, by permitting rapid dissipation of an electrostatic charge. Some recent investigations suggest that this desirable effect of atmospheric moisture may not be produced in cases where artificial air-conditioning has removed all carbon dioxide from the atmosphere and where, therefore, the thin film of moisture condensed on surfaces is not an electrolyte.

The pamphlet, which sells for thirty-five cents, will be of importance to insurance men and to the large number of administration and production men in whose plants this rather dramatic cause of fire and explosion may be present.

J.B.F.

BETTER MOUSETRAPS

(From page 36)

esearch Foundation, requires only that a simple device be fastened to the test member. This device, smaller than a half-dollar, is seen at the extreme left of the test member shown in the accompanying photograph. Wires then carry strain impulses to an amplifier and cathode-ray oscillograph fitted with a recording camera. Adjustments make it possible to determine either static or dynamic stresses and their direction. Since the readings can be made at a remote point, this new apparatus finds an almost infinite number of applications in the industrial research projects conducted at the Research Foundation.

PLANNING FOR THE POST WAR PERIOD

Speaking at the annual dinner of the American Society of Mechanical Engineers at the Hotel Astor, December 4, 1941, William A. Hanley, President, called for "some realistic thinking and some definite planning" for the post-war period.

Based on the estimate of the National Resources Planning Board that, if the war continues, nearly half of the country's 55,000,000 workers in 1944 will be either in defense projects or under arms, Mr. Hanley said that when the war ends we will have the colossal job of putting more than 26,000,000 workers back into peacetime employment.

"If all the men and women in America will become interested in this post-war employment," he declared, "and will individually adopt a policy to help in the solution, we can solve the problem, and America can thrive as she did thrive from 1790 to 1930. The solution lies with individuals to a greater degree than it does with corporations, municipalities or other groups.

"As individuals, as corporations, as cities and states and as a nation we should reduce our peacetime expenditures now, so that we can accumulate money to spend, and then spend it, when the war is over. Accumulate needs and money now. Satisfy those needs and spend the money when the war ceases.

"If we could have ten million orders for new automobiles in the first two years after the war, it would be very helpful. If the majority of car owners will drive their cars twenty-four months longer than has been their custom, then we should have the ten million orders for automobiles. As a patriotic duty, to save this nation at home, to save our form of life for ourselves and our children, to avoid Fascism, we should not only have this demand for ten million new automobiles but for great quantities of goods and commodities which must be produced by labor. We should accumulate the need for clothing, home furnishings, new equipment for homes and in addition accumulate the need for several million new homes."

Special Announcement—
Placement Office
Office Hours

On account of the enormous amount of detail that this office must handle to take care of the many alumni and students seeking change of positions, new positions, and part-time positions; questions pertaining to Selective Service draft; countless interviews week in and week out; correspondence pertaining to alumni and industrial firms; telephone calls in and out; and many other chores, it is now imperative for alumni to make arrangements ahead of time for visits to this office.

In the future this office will be open to alumni for conferences from 2:00 P.M. to 5:00 P.M. daily, except Saturday.

JOHN J. SCHOMMER
Director of Placement

AN EDITORIAL . . .

THE value of research expenditures as a key to future profits is an accepted fact among industrial executives. But determining the AMOUNT of research investments is a less simple question.

It has been convincingly argued, for example, that the research expenditures of industry in general are too low for the full benefits of research to be attained. In support of this argument is adduced the fact that in many industries the recognized leaders devote a larger part of every sales dollar to research than do other companies in the same field. It is reasonable to suppose that in the case of these companies there is a definite link between their commanding position and their greater emphasis on research—that other companies, by increasing their research investments, might expect to achieve like results.

There is little doubt that the argument is valid as a general statement of the case. To the individual manufacturer considering the expansion of his research program, however, the question may remain whether the general argument fits his specific case. Obviously, the likelihood of future profits must be a determining factor in deciding the desirability of most research plans. Probably the true test of the value of any specific industrial research project is the balance between current expenditures and future returns. Since future profits are difficult to predict with any degree of assurance, the manufacturer planning to increase his research investments will naturally desire to secure the most favorable balance by expending his research dollar to best advantage.

Perhaps the question is not "How much?" but rather "How effectively?" It is for this reason that many manufacturers, in planning their research activities, prefer to avail themselves of the facilities of an isolated laboratory, such as Armour Research Foundation, where projects can be carried on efficiently under advantageous conditions. Here skilled workers devote themselves to specific projects, economizing on time and effort as they work without interruption, utilizing research expenditures to the fullest measure. Under these conditions, the manufacturer has greater assurance of the favorable cost-profit balance which he desires.

—from THE FRONTIER, September, 1941

ARMOUR RESEARCH FOUNDATION

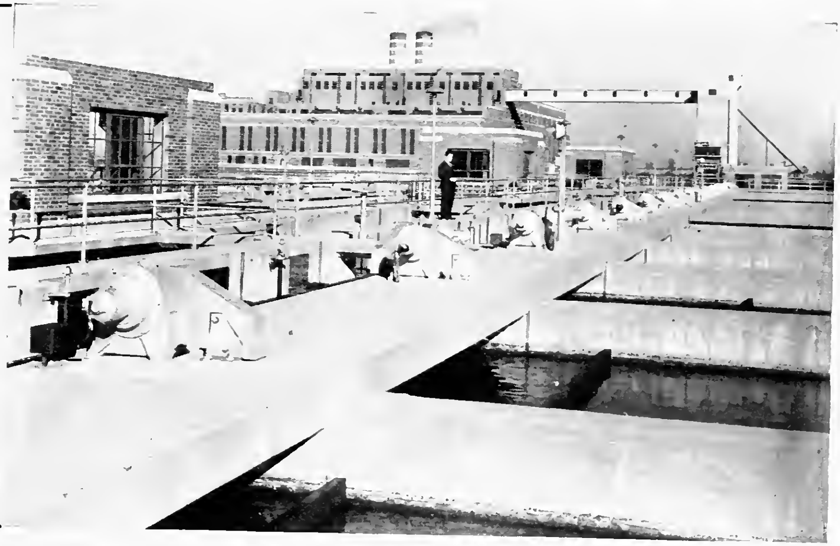
Founded to render a research and experimental service to industry

CHICAGO, ILLINOIS

LINK-BELT

LOOKS AHEAD-

WORLD'S LARGEST ACTIVATED SLUDGE PLANT, Southwest Sewage Treatment Works, Sanitary District of Chicago, is equipped with Link-Belt Straightline sludge collectors for primary and concentration tanks; straight-line mechanically-cleaned bar screens; mixers, screw conveyors, and belt conveyors for handling filter cake; water intake screens; coal handling conveyors, as well as power transmission equipment, such as variable speed transmissions, speed reducers, gears, bearings, etc.



with engineers who build for

BETTER LIVING

• The municipal engineer—like the fellow who will soon become one—is looking to the future. He anticipates the time when this country's productive effort will once again be turned toward improving the American way of life.

American cities are the healthiest, most comfortable, cleanest, and most convenient in the whole wide world because the municipal engineer, with the cooperation of Industry, has made it possible for the poorest citizen to enjoy such benefits as sewage treatment, water supply, fire protection, swift transportation, and an almost endless list of services which we Americans now accept as a matter of course.

But these things are only indications of what the future will bring forth. In engineering schools and experimental laboratories, at drafting tables and on test floors, great things are in the planning.

Link-Belt Company—a closely-knit organization of engineering specialists—will continue to serve the municipal engineer and American industry in the search for new and better ways to use improved mechanical equipment for the benefit of all mankind.

THE SYMBOL OF QUALITY LB LINK-BELT

LINK-BELT COMPANY

Engineers and Manufacturers of Materials Handling and Mechanical Power Transmission Machinery Since 1875

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LINK-BELT PRODUCTS INCLUDE: Sewage and water treatment plant equipment . . Elevators and conveyors of all types . . Coal and ashes handling equipment . . Portable conveyors and bucket loaders . . Traveling screens for water-intakes . . Skip hoists . . Car spotters and car hauls . . Water-front loading and unloading towers . . Coal storage and reclaiming systems . . Automatic coal stokers . . Screens of all types . . Friction Fighter self-aligning ball and roller bearing units, take-ups, hangers, gears, pulleys, sprocket wheels, chains, shafting, collars, couplings, clutches, etc. . . Silent and roller chain drives . . Variable speed transmissions . . Speed reducers of all types . . Chains for every power transmission and conveying service . . Roto-Louvre beat dryers and coolers . . Crawler-mounted shovels-draglines-cranes . . Locomotive cranes . . Tractor-mounted shovels and cranes . . Truck-mounted shovels and cranes . . etc.

With **MAUREEN O'HARA**
it's Chesterfield for Christmas
She is appearing in the
20th Century-Fox Production
"HOW GREEN WAS MY VALLEY"

FOR CHRISTMAS

It's Chesterfield

Here are your Milder Better-Tasting Chesterfields again **. . . in the most attractive, up-to-the-minute Christmas gift package of the year.**

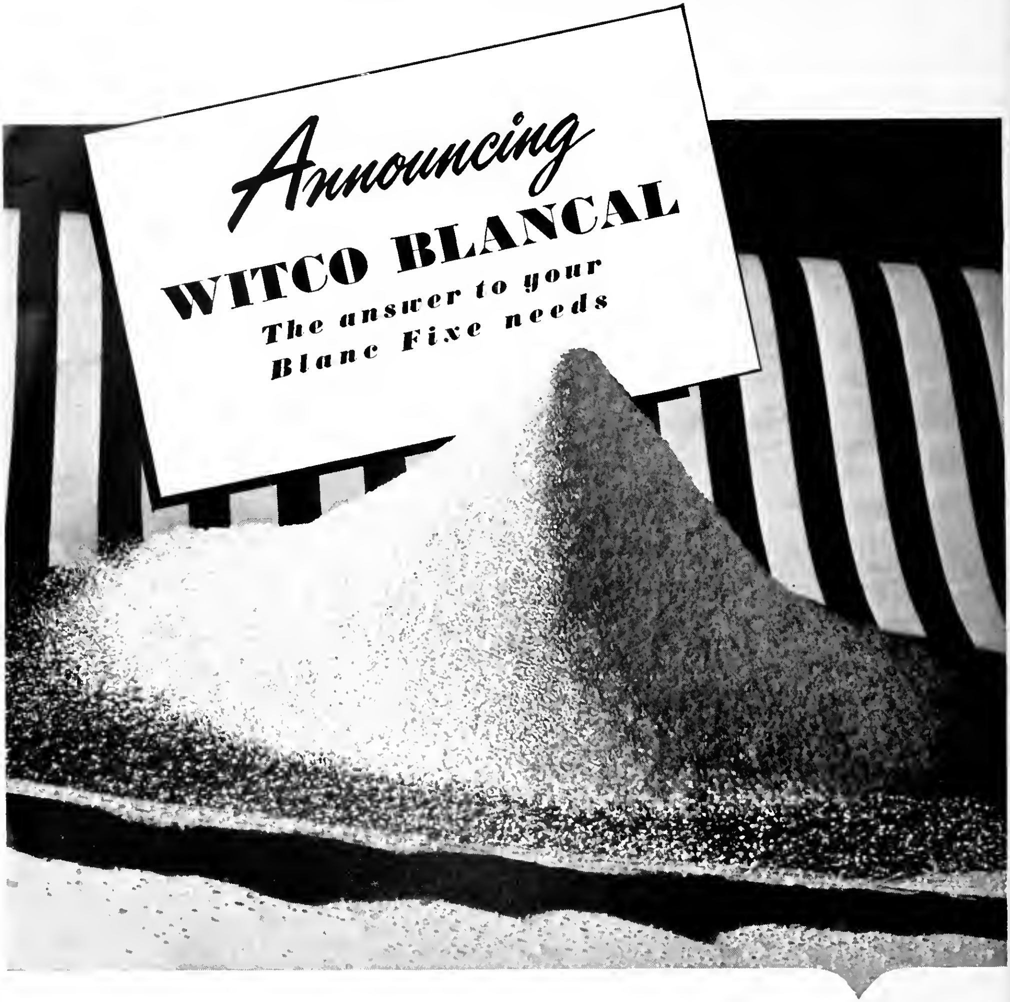
Buy them for the folks at home . . . send them to your friends and don't forget to mail them to the boys in the Service.

YOU CAN'T BUY A BETTER CIGARETTE *They Satisfy*

ILLINOIS TECH ENGINEER

AND ALUMNUS

MARCH, 1942



ARE you finding it increasingly difficult to obtain Blanc Fixe? Here is the solution to your problem—WITCO BLANCAL—a NEW product developed in the Wishnick-Tumpeer Laboratories. WITCO BLANCAL is a precipitated barium-calcium compound—in both low and high oil grades. Because it is an extremely finely divided extender, having excellent color in dry state as well as under oil, WITCO BLANCAL is practically certain to give you even better results than Blanc Fixe! And because less is needed in your formulations, due to its higher bulking value, you will find it more economical. Take this opportunity NOW to improve the quality of your products and at the same time make a substantial saving in cost. Our staff will gladly assist you in using this new development in your products. Mail the coupon for a sample today.

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Gentlemen:
☐ Please send me a sample of WITCO BLANCAL.
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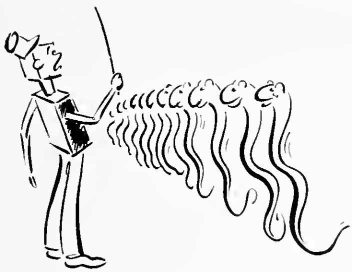
G-E Campus News

BLACKOUT WATCHMAN

THE problem of maintaining a night light in his place of business and at the same time complying with blackout regulations was solved by a Schenectady machine-shop owner by means of a G-E photo tube, or "electric eye." Rules required that all lights be extinguished within five minutes of an air-raid warning. That meant either hiring a watchman or turning out all lights at closing time.

The first night that the lights were turned out, the shop was broken into. So the owner, Andrew Tessier, put the "electric eye" to work. He installed the tube in an upstairs window, pointing at the nearest street light. When, during a practice blackout or raid warning, the street light is extinguished, the tube immediately turns out all lights in the shop. When the street lights go on again, so do the night lights. The "eye" provides a watchman who doesn't go to sleep on his job, and whose total cost is about two weeks' pay for an actual watchman.



MOLECULES MARCH!

WITH the increasing use of plastics and of artificial silk and rubber in defense activities, the structural qualities of the molecules that make up these materials is all-important to the scientists who are doing the research work.

Dr. Raymond M. Fuoss, of the General Electric Research Laboratory, in Schenectady, has found that some molecules wiggle like worms when an alternating electric field is applied to them. Such molecules are electrically lopsided, and when in an electric field they tend to line up, just as compass needles line up with the magnetic field of the earth.

From this tendency of the molecules to move to and fro in an electric field, scientists are able to determine how the various molecules are built. With this information, new molecules can be designed to meet specific needs. Since artificial silk and rubber and many plastics are composed of these worm-like molecules which react in an electrical field, materials of a wide variety of properties may be expected as a result of these researches.

NOT FOR WILLIE—

THE General Electric Company is proud of the variety of services it renders its customers. Nevertheless, company officials were surprised by one recent request from a woman who had seen a G-E advertisement in a magazine.

The illustration in the advertisement contained a picture of a young boy. The woman also had a boy, and her boy looked very much like the boy in the photograph.

Mother and son had only recently moved to New York. Since then, she had taken her son to a number of different barbers, but none of them had produced a haircut that suited her. And so, in desperation, she wrote to General Electric to find where the boy in the advertisement had his hair cut. It was just the type of cut she had vainly tried to get.

GENERAL ELECTRIC

953-34-211

Contributors

Alfred J. Cardall is director of the test service division of Science Research Associates, Chicago. He is a consultant and the author of several psychological tests, including a test of practical judgment, a primary business interest test and the Cardall arithmetical reasoning test. He holds bachelor's and master's degrees from Boston University, and the Ed. D. degree from Harvard. He has been a member of the faculty at Boston University. Dr. Cardall spent sixteen years in business and industry before devoting himself to personnel and placement work.

Warren L. Decatur is a cooperative student in the department of mechanical engineering, and is employed by the Edison General Electric Appliance Company. He is a graduate of Oak Park and River Forest Township High School.

Ernest H. Freeman is professor of electrical engineering.

Kathryn Judkins is business coordinator in the business and industrial management curriculum for cooperative students.

Robert C. Kintner is associate professor of chemical engineering.

John F. Mangold is associate professor of mechanics.

James C. Peebles is acting dean of Armour College of Engineering.

Paul O. Ridings is the newly appointed director of the news bureau of the Institute.

John J. Schommer is professor of industrial chemistry, director of physical education, and director of placement. He is also assistant to the adviser on occupational deferments, Cook County Appeal Board District, Selective Service.

E. C. Schroedel is manager of the institutional department of International Business Machines Corporation. He is a graduate of Union College and has done graduate work at Columbia University. He has been with I. B. M. since 1926, and is now in charge of installation of test scoring machines and electric accounting machines in colleges and universities, boards of education, and libraries.

Frederic R. White is instructor in English.

Cover picture by Bruce V. Kunde E. E. '44.

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IN THIS ISSUE

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OUR SHIPS BEGIN TO COME IN

By
PAUL O. RIDINGS

Houdini on his best night never performed more miracles—that is the conclusion one would draw after considering the facts and results of the Board of Trustees' dinner for the Alumni.

1. The Alumni of Armour, Lewis and Illinois Institute of Technology were merged into one common group, the Alumni Association of the Illinois Institute of Technology, by the adoption of a constitution.

2. One-million, one-hundred thousand dollars is now in the hands of President Henry Townley Heald of Illinois Tech, thus making it possible to begin building in the development program.

3. The alumni and the student engineers and technicians know that their war work is vital, and more important, know that it is appreciated to the extent that selective service executives feel that they should be deferred—Lt. Col. Paul G. Armstrong, head of the Illinois Selective Service, told them so.

4. The alumni present were sold on reasons why they must support the development program of Illinois Tech—sold by a "super-salesman," Clarence B. Randall, vice-president of Inland Steel.

5. More than 800 alumni were dedicated to the building of a greater Illinois Institute of Technology.

6. A crowd of more than 1600 alumni attended the dinner to make it the biggest in alumni annals and the biggest alumni dinner ever held in Chicago.

And this all happened—and a lot more—on Friday night, February 20, at the Grand Ballroom of the Stevens Hotel in Chicago.

The merger of the various alumni groups into one body was the climax of more than a year's work on the part of representatives from the alumni organizations of both Lewis and Armour. Chairmen of the committees representing both alumni groups reported to those present on the activity of the committees and the constitution the joint commitees were presenting.

Adolph H. Fensholt, Lewis '13, was one chairman, and J. Warren McCaffrey, Armour '22, the other. The latter as chairman of the joint committee presented the constitution and presided over the discussion. The constitution was adopted by a virtually unanimous vote—thus all graduates of Armour and Lewis, as well as graduates of the one school into which they have been merged, are now members of the Alumni Association of the Illinois Institute of Technology.

The constitution, as adopted, was published in the February issue of The Technometer. Interested alumni may obtain copies by writing to Mr. Arthur Wright, Alumni Secretary, Illinois Institute of Technology, 79 West Monroe Street, Chicago, Ill.

The presentation of the $1,100,000 check came at the conclusion and as the climax of Mr. Wilfred Sykes' report to the alumni on the progress of the development program. Mr. Sykes, who is president of Inland Steel, is chairman of the policy committee of the Illinois Tech Board of Trustees.

Mr. Sykes presented the check after the showing of slides illustrating the new campus and each of the buildings. He stated that the check should convince even the most skeptical that this was a fair start on the development program and asked the services of all present in the work to complete the program.

"This is OUR job," Mr. Sykes told the alumni, the friends, and the members of the Board of Trustees present.

The check represents slightly more than one-third of the goal set for the equipment and building fund in the campaign. The Illinois Tech development program calls for the raising of $3,100,000 for construction and equipment of new buildings, and for the addition of $275,000 to current annual income through endowment or other channels.

"You are without question necessary men in this war effort," Lt. Col. Paul G. Armstrong, state director of the selective service, told the alumni in his address of the evening.

"Engineers and other technicians must be kept on the home front fighting in the battle line of production," Col. Armstrong stated.

"For if this war is to be won—and I am one who believes that it will be won—it will depend upon two factors, absolute unanimity of thought and action on the part of all Americans, and even more important, the ability of industry to deliver when and where needed the implements of war."

Emphasizing the importance of the latter factor, Col. Armstrong declared, "This is a war of production lines." He pointed out that in this war in contrast to the last, which he said the United States fought with ninety per cent of the other fellows' equipment, this country was confronted with the job of not only producing "our equipment, but the other fellows' as well."

"We are trying to educate our local draft boards that they must not take one single necessary man from industry," he said. "They must not impede the war effort."

"You are engineers," Col. Armstrong told the Illinois Tech alumni, "and there is no greater shortage in any field of industry than there is of engineers. You are without question vital men in this war effort."

Col. Armstrong spoke very frankly—and ofttimes preceded his remarks by "this is off the record"—with the guests at the dinner. He clarified the entire draft set-up and gave many insights into its operation.

Among the topics he discussed which struck a popular note with the crowd was that concerning the status of men married since Oct. 1, 1940. He stated that draft boards were forced to decide if the marriage was the outcome of "the natural course of human events" and was not influenced in any way by a desire to evade the draft.

"But," said he, in reporting the findings of a survey by his office of the marriage license rate in all parts of Illinois, "marriages have increased 47.3 per cent since Oct. 1, 1940, 'in

Wilfred Sykes (right) presents check to President Heald

the normal course of human events.'"

"An institution that was ready when the crisis came:" that was the way in which Clarence B. Randall, vice-president of Inland Steel, characterized the Illinois Institute of Technology in his address of the evening.

"Twelve thousand men were being trained here, trained to do their part in vital industries in the national war effort." Mr. Randall went on as he paid tribute to Illinois Tech.

"Chicago, the great throbbing center of the nation's production found a school ready to supply its demands. The responsibility for this goes not to you, not to me, nor to any man in this room, but instead to two far-sighted men of the past, Mr. Armour and Mr. Lewis."

Mr. Randall then went on to explain how both Armour and Lewis had been able to operate because certain wealthy men had annually met the deficits. Then he concluded that that day was past. "There will be no wealthy men in the future," he said, "so support must come from somewhere else."

That support, he concluded, must come from "you and me—the fellows of the community," after having explained why both public funds and a raising of tuition would not fit into the picture of a school such as the Illinois Institute of Technology.

Mr. Randall also explained how all schools operated only with the help of others and that someone else was paying the bulk of the bill for every student being educated at any great American school.

"Endowment," he said, "is the accumulated unselfishness of mankind."

"Do you alumni understand that someone else paid for your education?" Mr. Randall asked the guests in his challenging conclusion.

"Do you alumni believe in the future of Illinois Institute of Technology?

"If not, endowers are not interested in your school; if so, you too will make contributions to this development program, contributions of work and money, contributions of sacrifice. And if you do this, endowers will catch the contagious spirit of your enthusiasm."

The enthusiasm of the banquet and those present was contagious in itself—more than half of the alumni present at the dinner left, not only members of a new, greater body, the Alumni Association of the Illinois Institute of Technology, but also pledged to do their part in "OUR JOB"—the creation of a greater Illinois Tech.

For at the dinner the alumni were given the opportunity of signing a "Dedication" card—more than half of the number present did. That card read:

I BELIEVE in Illinois Institute of Technology, its purpose and its future.

I BELIEVE in its dedication to the highest standards in Education and its consecration to the Victory Program of America.

As an alumnus, proud of its traditions and of its program, sharing in its heritage and ideals—

I WILL devote, so far as it is within my power, time and effort to assure success of its Special Development Program, and

I WILL enlist with others to carry the story of its purpose, its achievement and its need to those from whom that support must be sought.

Colonel Armstrong tells engineers of their importance in the war program.

AUTOMOBILE DRIVING AS A PROBLEM IN MECHANICS

By
J. F. MANGOLD

This article treats of the simpler forces acting on an automobile under the varying range of driving conditions. An attempt will be made to bring out those particular points which are of most general interest. It is hoped that it will be possible to emphasize the effects of the actions of those forces, the knowledge of which is not very widespread. Thus there will be a simplified analysis of the forces acting both in starting and in stopping a car, and in passing over both horizontal and vertical curves. From other analyses, it will be possible to determine the time and the distance in which a car can be brought to rest from a designated speed, or can be brought from rest to a designated speed.

A popular misconception exists as to the real location of the forces which are involved in the control of the car. When the purchase of a new car is under consideration the first point noted is the horse-power of the engine, and the conclusion is frequently drawn that the larger the horse-power, the more perfect must be the control of the car.

It is well to recall that the laws of mechanics apply here. Most of our problems are concerned with the forces which produce either acceleration or deceleration. The following equations will be needed in our analysis: (1) $\frac{P}{W} = \frac{a}{g}$, or, as usually written, $P = \frac{W}{g}a$. This is an equation form of the statement that the ratio of any force is to the force of gravity, represented by the weight, as the ratio of the acceleration produced by the force is to the acceleration produced by the force of gravity. P is the resultant force in lbs., a is the acceleration in ft. per sec. per sec., and g is equal to 32.2 ft. per sec. per

Fig. 1.

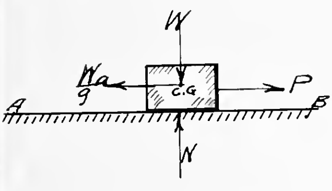


Fig. 2

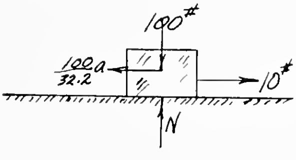
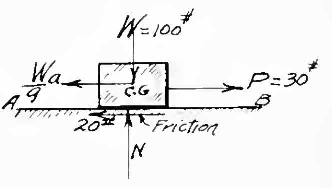


Fig. 2b.



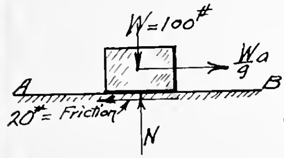


Fig. 3.

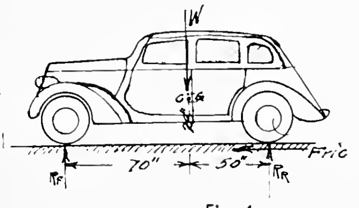


Fig. 4.

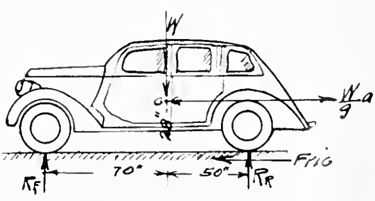


Fig. 5.

sec., this being the acceleration due to the weight of a body, under the conditions of free fall In this equation the quantity $\frac{W}{g}a$ may be regarded as the action opposing the accelerating force and is called inertia force or inertia reaction. It acts through the center of gravity of the body as indicated in the sketches. The weight is always understood to act through the center of gravity, while the resultant force P may act at any height. The effect of a shift in the position of P will be to produce a change in the position of the reaction N. Fig. 1 shows a simple free body. AB is the plane on which the body is moving due to the resultant force P. The resistance which the body offers to oppose acceleration is the inertia force or the inertia reaction, $\frac{W}{g}a$. Other equations which will be needed are, (2) $V = V_0 + at$; (3) $V^2 = V_0^2 + 2as$; (4) $s = V_0t + \frac{1}{2}at^2$; (5) $s = (\text{aver. } V)t$. In these equations, V stands for final velocity in ft. per sec., V_0 is the initial velocity, a is the acceleration in ft. per sec. per sec., and s is the distance covered in ft.

In Fig. 2 numerical values are introduced.

The relation of the forces will be

$$10 = \frac{100}{32.2}a;\ a = \frac{10 \times 32.2}{100} = 3.22 \text{ ft.}$$

The body will be accelerated to the right at this rate. If the body starts from rest, then $V = 3.22 \times 10 = 32.2$ ft. per sec. which will be the velocity after 10 secs. Since the average V is $\frac{O_2 + 32.2}{2}$, $s = 16.1 \times 10 = 161$ ft. This will be the displacement to the right from the original position of the body.

In Fig. 2b the additional force of friction is shown; its value equals the product of the coefficient of friction times the normal pressure. Thus friction equals $f \times N$, f being the coefficient of friction, and in this case 0.2. A summation of forces equals, $30 - 0.2 \times 100 = 10 = \frac{100}{32.2}a$. The computed values for acceleration velocity and distance will be the same as for the previous situation in Fig. 2.

Fig. 3 is similar to 2 except that the 30-lb. pull has been removed and the body is coasting to rest, being retarded by friction. Since the inertia force is always in the direction opposed to the accelerating or decelerating force, the inertia force will be represented by a vector pointing to the right. The retarding force is 20 lb., and $20 = \frac{100}{32.2} \times a$. Solving, $a = 6.44$ ft. per sec. per sec. The body will lose velocity and will come to rest in a time, computed from $O = 32.2 - 6.44\,t$, or $t = 5$ sec. The cases cited in Figs. 2 and 2b are comparable to those of starting a car, while that of Fig. 3 corresponds to a car coming to a stop under the action of friction resulting from application of the brakes.

The starting forces in an an automobile are very important. There is a powerful engine under the hood, which could easily deliver from 70 to 120 horse-power in a shop or a factory. Now this same engine can transmit its energy in driving a car only through the force of friction between the tires and the roadway. This force, called a tractive force, varies with the condition of the roadway and of the tires and is quite independent of the horse-power of the engine.

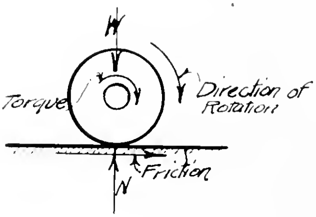


Fig. 6.

Consider the automobile as a free body and indicate the active forces. Fig. 4 shows the forces present when the car moves at a constant speed. Fig. 5 shows the forces when the car is being accelerated. In both cases the control of the car is centered in the extremely small area of contact of the tires with the roadway Both figures show that the force external to the car, and acting in the direction of motion, is the force of friction and is also the propelling force. In order to analyze more clearly this friction, let the driving wheel be set out as a free body as in Fig. 6. If the car moves to the right, the wheel rotates as shown by the curved arrow. Since the torque has been transmitted to the driving wheels and the rear axle by the engine, a frictional force must be developed under the wheels to prevent skidding. The action of the wheels on the roadway is to exert a force toward the rear; then the roadway must exert a forward force of the same amount. Considering the automobile as a free body, the action of the roadway against the car must equal the action of the driving wheels against the roadway. The amount of this force can never exceed the maximum possible friction under the drivers. This value is $F = f\,R_r$, where R_r is the amount of the rear reaction. In the final analysis, the friction under the driving wheels is the external force, which is a measure of the propelling force. Thus the torque transmitted to the rear axle and driving wheels by the engine is equal to the friction under the driving wheels times the radius of these wheels. Consider an engine rated at 60 horsepower and rotating at 2000 R.P.M. The explosions in the cylinders of the engine communicate a torque to the drive shaft. The horse-power of the engine is given by the relation $H.P. = \frac{2\pi TN}{33000}$, where T is the torque in foot lbs., delivered by the cylinders, and N represents the R.P.M. Then, $60 = \frac{2\pi T\,2000}{33000}$, from which, $T = 157.5$ lb. ft. Assuming an 85% efficiency of transmission, and a speed ratio of 4.5 to 1, the torque transmitted to the rear axle will be $T = 157.5 \times .85 \times 4.5 = 603$ lb. ft. The moment of friction under the drivers must equal the transmitted torque, or $F \times \frac{7}{6} = 603$, from which $F = 517$ lb, when $\frac{7}{6}$ is the radius of the wheel. If the car weighs 4000 lb., and one half of the weight rests on the drivers, the force of friction with $f = .4$ will be $F = .4 \times 2000 = 800$ lb. Since this available friction is considerably in excess of the 517 lb. needed, there will be no difficulty in securing the force required for driving. Assume a second case with a speed ratio of 7.5 to 1, other conditions remaining the same; the torque to be transmitted will be as before, or 157.5 lb. ft., and the torque delivered to the rear wheels is

$$T = 157.5 \times .85 \times 7.5 = 1010 \text{ lb. ft.}$$

Then $F \times \frac{7}{6} = 1010$, or $F = 863$ lb.

With the same f as before it is seen that a frictional force of 863 lb. is needed, while a force of only 800 lb. is available. These conditions would set up a difficult situation and motion would not be possible. The result would be that the wheels would spin. It would be necessary to reduce the

engine speed so as to reduce the torque transmitted and in turn reduce the friction required. This can be accomplished by feeding less gas. Since the torques are proportional to the speeds, the desired speed can be computed from the relation $\frac{N}{2000} = \frac{800}{863}$.

$$N = \frac{800 \times 200}{863} = 1855 \text{ R.P.M.}$$

Consequently if the engine speed is reduced from 2000 R.P.M. to 1855 R.P.M there would be enough friction to prevent skidding.

Some investigation will now be made regarding the frictional force required for various values of acceleration. Thus with acceleration of 6 ft. per sec. per sec. the amount of the inertia force would be

$$\frac{W}{g}a = \frac{4000}{32.2} \times 6 = 745 \text{ lb.}$$

Since the friction or tractive force must be equal to the inertia resistance, F = 745 lb. It now remains to determine the actual pressure on the drivers and the coefficients of friction needed. Take moments about the point of contact of the front wheels with the roadway. For the particular dimensions given,

$$120R_r = 4000 \times 70 + \frac{4000}{32.2} \times 6 \times 28; \text{ and } R_r = 2507 \text{ lb.}$$

The necessary coefficient of friction will be $f = \frac{745}{2507} = 0.297$.

Similarly, for $a = 12$: $F = 1490$: $R_r = 2681$; $f = 0.557$
$a=16$; $F=1985$; $R_r=2795$; $F=0.71$

For a range of accelerations from 6 to 16 ft. per sec. per sec., there is a progressive increase of pressure on the rear tires from 2507 to 2795 lb. Friction increases from 745 to 1985 lb., and coefficients of friction increase from 0.297 to 0.71. The lower values are within the possibilities of the roadway, but the higher values are very doubtful, since they require a dry and somewhat rough roadway.

Physical discomforts determine whether the driver of a car will accelerate at the higher values. From various tests it appears that a value of acceleration or of deceleration of about 8.5 ft. per sec. per sec. is the limit of comfort and is the value which the driver of a car will not be likely to exceed.

Another factor of great importance at this time of tire shortage is the increase in the friction required as the rate of acceleration increases. For conditions cited, this friction increased from 745 lb. to 1985 lb. This increase in the grip of the tire on the roadway will mean much greater wear and a much shorter life for the tires. This will be increased still further if the coefficient of friction decreases suddenly on some intermediate stretch of roadway and actual skidding takes place. Thus slower starting and slower stopping are conducive to longer life of the tires.

A few computations from which the distances required to attain various speeds will be of interest. Thus, starting from rest, to attain 30 miles per hour, with a equal to 6 ft. per sec. per sec. from equation (3) $44^2 = 0+2\times6\times s$. from which $s=162$ ft. Similarly, for $a = 8$, $s = 121$ ft.; for $a = 10$, $s = 97$ ft. The corresponding times required to attain the speed will be computed from equation (2). Then for $a = 6$, to attain 30 M. P. H. $44 = 0 + 6\ t$ and $t = 7.3$ secs.

For $a = 8$, $t = 5.5$ secs. For $a = 10$, $t = 4.4$ secs. These foregoing computations assume that the friction requirements are met. See Fig. 7.

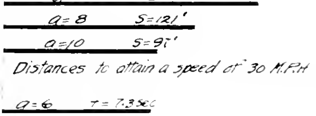


Fig. 7

Another important phase of the problem concerns the forces involved in stopping the car from assigned speeds. The active forces are shown in Fig. 8. The inertia force is seen to act forward, and the friction under the wheels must act toward the rear. The direction of the friction may be made more clear from a consideration of the wheel alone. Thus in Fig. 9 the friction applied to the brake drum tends to lock the wheel and cause it to skid. This action exerts a forward force on the roadway. Considering the wheels and car as the free body the action of the roadway on the wheels will be toward the rear. The maximum value of this force will be the friction just at the instant when sliding is impending, and will be given by the product of the coefficient of friction times the weight of the car when four-wheel brakes are used. There is a very appreciable difference between the pressure on the wheels

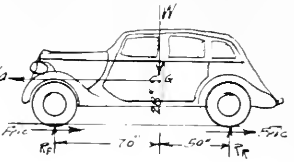


Fig. 8.

when the car is moving at a uniform speed and when it is being brought to rest. Thus the rear reactions for uniform motion will be

$120\ R_r = 4000 \times 70$; $R_r = 2333$ lb.

Fig. 8 shows a second condition assuming full braking effect under all four wheels with the wheels just on the point of skidding. With a coefficient of friction of 0.6 the force of friction will be, $F = 0.6 \times 4000 = 2400$ lb. Taking a summation of forces parallel to the direction of motion, $0.6 \times 4000 = \frac{4000}{32.2} \times a$, from which $a = 19.32$. Taking moments about the point of contact of the front-wheel tire with the roadway,

$$120\ R_r = 4000 \times 70 - \frac{4000}{32.2} \times 19.32 \times 28; \ R_r = 1573 \text{ lb.}$$

This value is 560 lb. less than the value of R_r for the car either at rest or in uniform motion.

If the frictional force increases, the rear reaction becomes less and an extreme condition could be reached at which overturning could take place as a forward somersalt about the front axle. Since the coefficient of friction is not likely to exceed 0.8, overturning forward is quite improbable. To attain this condition of impending overturning, the rear reaction would have to be equal to zero, and the moment of the weight would have to equal the moment of the inertia force, or,

$$120\ R_r = 4000 \times 70 - \frac{4000 \times a \times 28}{32.2}.$$

Since $R_r = O$.

$$\frac{4000}{32.2} \times a = \frac{4000 \times 70}{28} = 2.5 \times 4000$$

Then $F = 2.5 \times 4000$. It is seen that a coefficient of friction of 2.5 would be needed to produce a condition of possible overturning. However, this might be brought about in a case when the front wheels strike an obstruction. This possibility of overturning is increased considerably if the center of gravity of the loaded car is raised. Thus, let this center of gravity be

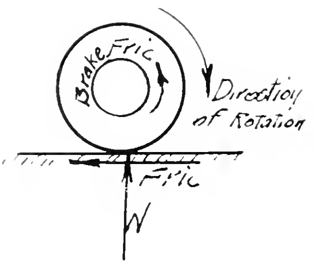


Fig. 9.

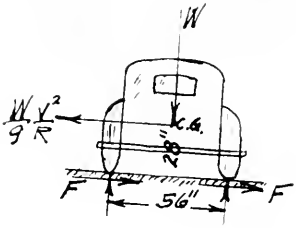


Fig. 10.

raised one ft. so that it will be 28 + 12 or 40 inches above the roadway. then the equation becomes

$$0 = 4000 \times 70 = \frac{4000 \times a \times 40}{32.2}, \text{ or}$$

$$\frac{4000}{32.2} \times a = \frac{4000 \times 70}{40} = 4000 \times 1.75.$$

Then F = 1.75 × 4000, or a coefficient of friction of 1.75 as against 2.5 for the previous case. Here it should be stated that so large a coefficient of friction cannot be obtained, but an effect equivalent to the action of the forces above might be produced by running suddenly into an obstruction.

As previously stated the driver is not likely to subject himself to the discomfort occasioned by the extreme decelerations mentioned, so that a value of a = 12 is about the maximum that will enter into our practical computations. For this value of a.

$$f \times 4000 = \frac{4000 \times 12}{32.2}, \text{ and } f = 0.37.$$

Such a value is easily realized. The stopping distance required from 60 M.P.H. is now easily computed from $V^2 = V_0^2 + 2as$,

$0 = 88^2 + 2 \times 12 \times s$, and s = 322 ft.

Similarly the stopping distance from 45 M.P.H is s = 181.5 ft.

In all these relations it must be borne in mind that the kinetic energy possessed by the car must be absorbed by the work of friction. Since work is the product of a force times a displacement, an appreciable distance must be traveled before friction can produce the desired results. The reader may be familiar with the statement sometimes made by certain drivers that they have such good brakes that they can stop on a dime. Such a statement must now appear quite absurd.

Setting up the previous problem from the standpoint of work and energy, then

$$0.37 \times 4000 \times s = \frac{1}{2}\frac{W}{g}V^2 = \frac{1}{2} \times \frac{4000}{32.2} \times 88^2.$$

Solving, s = 322 ft.

A point not yet taken into account is the reaction time of the driver. This is the time required for the driver to decide what he will do under a given set of conditions. Usually it takes him more than one-half second to start to apply his brakes and during this time his car will have moved either 44 ft., or 33 ft., depending on his original speed, of 60 or 45 M.P.H.

A car passing over either a horizontal or a vertical curve is subjected to additional forces. Inertia tends to keep the car moving in a straight line, and so, when rounding a curve, a force must be set up to change the direction in which the car is moving at the instant so as to cause it to follow the curved path. This force is called centripetal force and is due to the friction under the tires; it is directed toward the center of the curve. The car offers a resistance to the change in its direction, which resistance is called centrifugal force, and acts outward through the center of gravity of the car. Since the normal accelerating force must be equal to the inertia force this relation may be written mathematically as,

$$F = \frac{W}{g} \times a = \frac{W}{g}\frac{V^2}{r}, \text{ since } a = \frac{V^2}{r}$$

This force varies with the square of the velocity and inversely with the radius of the curve. On a level and straight road a minimum of attention needs to be paid to the forces acting on the car. However, a wind might cause a swerving, or a pedestrian may cause a deviation from the straight line of travel. Fig. 10 shows the forces acting. Since the centripetal force acts toward the center and the centrifugal or inertia force acts outward, these two forces constitute a couple which tends to overturn the car. For the extreme condition of impending overturning the entire vertical reaction would be concentrated under the right wheels. This reaction together with the weight form a couple which tends to resist overturning, and has a definite value since its depends on the weight only. The overturning couple is a function of the square of the velocity for any particular curve. Assume that the radius of a curve is 100 ft., and that the speed is 30 M.P.H., then Fric. = F = f W = $\frac{W}{g} \times \frac{44^2}{100}$. The value of f to prevent sliding will be

$$f = \frac{44^2}{32.2} \times 100 = 0.6.$$

This value of f appears as rather a high requirement, and it is therefore quite possible for skidding to take place. The resisting couple is equal to $4000 \times \frac{56}{2} = 4000 \times 28$. The overturning couple is equal to 0.6 + 4000 × 28. Thus there seems to be no danger of overturning, yet this possibility does exist. Suppose that a skid should occur and be suddenly arrested as when a car slides into a curb, then due to the sudden stopping a large force is generated which might increase the overturning couple to the danger point. It should be noted that in passing over a vertical curve which is convex upward, the centrifugal force will be upward and will decrease the pressure on the tires and consequently the friction will be less than on the level and there is danger of a skid.

Some idea of the magnitude of the force developed when a 4000-lb. car hits an obstruction while traveling at 30 M.P.H. may be obtained from a typical computation. Assume that the resistance increases uniformly from zero to a maximum at the time of stopping, and let the distance be 5 ft. Then in terms of work and energy,

$$\text{Force} \times \frac{5}{2} = \frac{1}{2} \times \frac{4000}{32.2} \times 44^2 \text{ and}$$

Force = 48,000 lb. This is seen to be a tremendous striking force. The result is based on the assumption that there is no elasticity either in the car or the obstruction. A part of the shock is taken up by elasticity, so that if a reduction of 50% in the blow is assumed the value is still sufficient to do great damage. Since the kinetic energy varies with the square of the velocity, the blow delivered by a car moving at 60 M.P.H. would be four

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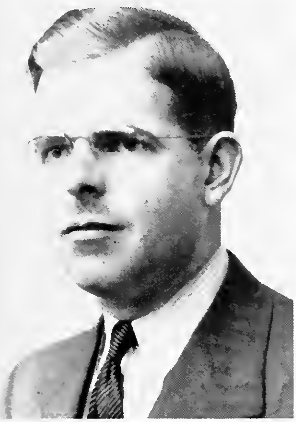
PORCELAIN ENAMELING

By
WARREN L. DECATUR



Monfort Studio

INTRODUCTION

Porcelain enameling is an ancient process that dates back to the Egyptian era. However, it was not until the fifteenth century that enamel could be applied on metal surfaces to form a solid background upon which other decorations could be applied. This discovery marked the transition from the early enamels, which were used for decoration, to the enamels of today, which are used for many utilitarian purposes.

The first experiments in enameling iron were made during the latter part of the eighteenth century. Rinman worked with wrought iron in 1782 and Hickling obtained a patent for the use of enamels on cast-iron parts.

Porcelain enamel now became a finish and a protective coating over a heavy piece of metal. This change in the metal base necessitated comprehensive changes in the composition of the enamel. Later, enameled sheet steel came into general use, bringing about further changes in enamel composition and methods of application. For a satisfactory bond on either cast iron or sheet steel the enamel had to have a thermal expansion similar to that of the base metal. Also the firing temperature of the enamel, particularly when applied to thin steel, had to be kept as low as possible to prevent warping of the metal. The porcelain had to have toughness and good adherence to withstand household usage.

Previous to this time the cost of enamels was relatively unimportant. The price was practically negligible when they were used in miniature or as decoration on precious metals. Now the situation was entirely changed. Henceforward enamel was used mainly because of its remarkable properties as a life-time finish rather than to beautify art objects. Therefore, enamels could not command high prices and the cost of the finished piece was now of importance.

What follows applies to present methods of sheet-steel enameling.

INDUSTRIAL ENAMELING

Finishing is an important process in connection with the electrical appliances manufactured by the Edison General Electric Appliance Company. Porcelain enamel is used to finish major appliances such as electric ranges, dishwashers, clothes washers and many others. Porcelain will retain its beauty and color for a lifetime. It is easy to keep clean, is not easily scratched or marred, and is capable of withstanding rather hard blows without chipping.

The production of high-grade enamels and satisfactory enamel finishes from day to day is a highly specialized process which requires extreme care and precision. In the cleaning of the steel, preparatory to applying the base coat, great care must be taken so that the piece enters the enamel tanks "surgically clean." Milling the enamel requires precision in the measurement of ingredients and in the time of milling. Close control of the cleaning and milling processes as well as of applying the enamel is required.

CLEANING AND PICKLING

A clean surface is the first essential for a satisfactory enamel finish. It is necessary to remove all oil, grease, and rust from the steel to insure good adherence of the enamel coating. This process consists of degreasing, rinsing, pickling in sulphuric acid, rinsing, neutralizing and drying. Bad finishes due to faulty cleaning may be in one or more of the following forms:

1. Tearing in ground (base) coat.
2. Copperheads (Star shaped pits which have a metallic lustre at their centers).
3. Fish scale (Scattered eruptions resembling small scales).
4. Boiling through and black specks in the finish.

Increased labor costs are caused by these defects because it is necessary to re-work the finishes and in extreme cases the ware has to be stripped of its finish with caustic soda or by sand blasting.

TYPES OF DIRT

The parts to be enameled are usually received at the enamel shop covered with one or more of the following types of dirt: (1) lubricants which may be in the form of animal, vegetable, or mineral oils, or drawing compounds (soaps), grease, etc.; (2) grit; (3) mill scale and rust.

Lubricants and grit are removed by an alkaline cleaner and the rust and mill scale are removed by acid. Animal and vegetable oils are saponifiable; they react with caustic soda to form materials which are soluble or miscible in water. The mineral oils which are not saponifiable are removed by emulsification. The cleaner baths are kept hot and agitated; this aids the removal of dirt and speeds up emulsification and also hastens the reaction of the acid and alkaline solutions.

The temperature and concentration of the pickling solution are strictly controlled in order to maintain optimum working conditions. The removal of rust and scale is a most necessary part of the cleaning process. The acid dissolves the rust and attacks the iron, producing hydrogen gas, which forces the scale off the metal surface.

The function of the neutralizer is to remove any remaining acid that has not been rinsed off and to change the ferrous sulphate to ferric hydroxide. The ferric hydroxide gives the ware a light straw color which indicates that the ware is properly pickled.

MILL ROOM OPERATIONS

The milling or preparation of

enamel slips of proper fineness and consistency from day to day is one of the important functions of the enameling department.

An enamel slip is a system containing a suspension of different solid phases in one liquid phase. The particle size of the solids varies from colloids to 100-mesh material. The solids consist of frit, clay, opacifiers, etc. The liquid is a water solution containing electrolytes in the form of soluble salts which are added as set-up agents.

The consistency of enamel slips depends on the following factors: the amount and kind of colloidal matter, the amount of water in the slip, the degree of peptization of the colloidal matter, and the size and specific gravity of the particles.

An enamel slip to be usable must have good suspension properties and proper mobility. If the frit particles in a slip settle too rapidly, it is not usable from a production standpoint. If the slip contains insufficient set-up to remain on the surface of the steel in the thickness required, it is not usable. This set-up is easily restored by the addition of an electrolyte. Clay is added to the mill to suspend the finely divided particles of frit in the water, thus increasing the viscosity of the water suspension. Clay is a natural colloid and swells by absorption of water; this makes the fluid more viscous, or in other words decreases the fluidity of the mixture.

When an electrolyte, for example, sodium nitrite, is added, the fluidity is greatly decreased; this addition produces a gel or a plastic mass which offers resistance to the settling of particles of frit. The sodium nitrite is said to peptize the slip.

It is of utmost importance to keep the mill room clean and free from dust and dirt. All containers must be kept free from lumps and dirt that would contaminate the freshly milled slip. Quality checks are made on incoming shipments to insure satisfactory results in production. Aging and stored slips should be agitated constantly. The methods of agitation are: manual, mechanical, and compressed air. Agitation by compressed air is the most satisfactory if the source of air is clean. The manual method is tedious and is therefore sometimes carried out incompletely. The mechanical method is likely to contaminate the slip with grease or small metallic particles from the mechanism.

Charging the Mill

The first step in charging a mill is weighing the ingredients making up the mill charge. Two sets of scales are used, one for the bulky material such as frit, clay, and opacifier and one for the less bulky part of the charge such as setting-up materials, borax, etc. Accurate weighing of the ingredients is of prime importance. After the ingredients are weighed, the mill is to be charged as follows:

1. Add ingredients of which small quantities are required.
2. Add frit.
3. Add clay.
4. Measure and add water.

The mills are equipped with revolution counters. The specified fineness of the slip is usually known to require approximately a given number of mill revolutions; as the counter approaches this figure fineness checks are made until the desired fineness is achieved.

Emptying Mills and Storing Slip

The slip is drained into a pressure tank passing through a forty-mesh sieve, a roto spray, and a magnetic separator. The slip is then pumped into an overhead storage tank. The mill is partially filled with water and revolved in order to remove any remaining particles of slip.

Care of Mills and Inspection

The mill linings and the porcelain balls are inspected every month. Mill linings (porcelain bricks) wear away by abrasion, exposing the steel shell. If the steel shell is exposed metallic particles are rubbed off and contaminate the slip. Balls that have become "out of round" or broken are removed and replaced by new ones.

Reclaiming Enamel

All spray-booth waste enamel is shoveled into boxes and returned to the mill room. The ground-coat enamel is re-milled after sufficient water and clay have been added. This slip is used for reinforcing and respraying and for special black work. The finish coat reclaim enamel is either re-smelted or re-milled with clay and water and used for a first finish coat.

Ground Coat Application

Ground-coat enamels are applied by dipping or slushing. These methods are more practical than spraying as there is less loss of enamel and a more even coating is obtained.

It is necessary to maintain the physical properties of ground-coat slips as near a set standard as possible. There are two things that may decidedly change the consistency of the slip. They are temperature variation and aging. An increase in atmospheric temperature causes a decrease in the yield and increases the mobility. The yield value, or loss of set, is greatly reduced with aging.

Dipping and Draining

In order to maintain uniform coatings on the ware, several things must be done by operators who are trained to dip as nearly alike as possible. Rubbing the ware in the ground-coat, removing the part at a certain angle and at the proper speed, and the angle at which it is allowed to drain all have effects on the thickness of the enamel adhering to the steel. Dippers have certain "tricks of the trade" that almost insure satisfactory finishes. For example, sponging and wetting a certain area of a part is done to obtain a uniform coating. "Cupping" (pouring slip over the part with a cup) is done to eliminate drain lines.

Drying

The ware is dried in a continuous oven. The temperature of this oven is regulated so that drying is not too rapid. Atmospheric humidity plays an important part in the drying process. If the air is extremely dry, the top enamel dries before the water in the lower level has come to the surface; thus the water is trapped. This may cause blistering and popping-off during the firing process.

Reinforcing

Flanged parts are hung on the drying rack at an angle and a somewhat thinner coating remains on the back of the part and the upper edges. The back and edges have to be re-coated by spraying. Otherwise, the steel would burn through in these areas.

Firing Ground Coat

The object in burning or firing ground-coated ware is to produce a coating of maximum adherence and one which in itself acts as a finish or one which is a suitable bond coat for succeeding coatings. If the ground coat is under-fired this is indicated by the fact that the color does not change but remains a pale blue. When over-fired, the ground coat has a greenish appearance.

An under-fired ground coat is very likely to give fish-scaling trouble. An over-fired ground coat is not suitable as a bond for a cover coat because black specks appear in the cover coat.

Cover Coat Application

The method of applying the cover coat is by spraying rather than dipping. It is very important to use slips of uniform consistency, fineness, and cleanliness. The slips are checked and approved before being delivered

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SELECTION AND TRAINING FOR TOMORROW

By

ALFRED J. CARDALL

A test consultant sat at a busy executive's desk. The executive complained of the high rate of turnover among his bookkeepers. In summarizing his methods of selection he stated, "If the young man can sell me he is hired." "Then," commented the test consultant, "what you are really hiring are salesmen, not bookkeepers."

A fundamental principle of selection in any business or industrial situation is a knowledge of what the particular job involves. Without this knowledge selection must necessarily be haphazard. Personnel workers today are becoming increasingly impatient with the old style hit-or-miss hiring methods. Now that the labor market faces acute shortages in many areas, personnel men are becoming increasingly alarmed at the inefficiencies of the "interview-only" method. To be sure, this method gives the interviewer a more or less definite estimate of the individual's skills, general abilities, and personality traits, and helps him determine whether or not the applicant would be a good company "risk" and the likelihood of his succeeding on a particular job. But by supplementing such purely *subjective* judgment of abilities and skills by *objective* measurement of them, a much more accurate appraisal of the individual can be obtained.

Scientific selection then attempts to add nothing new to the interview technique; rather it attempts to accomplish the same results more accurately, and more objectively, thus eliminating a large margin of human error. Of course, there is also error in measurement, but such error occurs within rather definite statistical limits which cannot be inferred for the much wider range of human error in judgment. However, industrial testing should not be considered as a device to eliminate the interview. As pointed out above, test results of observable and measurable differences essential to the job functions involved should supplement established hiring techniques. While the number of tests applicable to business or industrial situations is limited, such tests can help in evaluating essential factors which cannot be adequately determined in the ordinary interview.

But, the executive may argue, in these times of labor shortage, he can't afford to be selective but must hire almost anyone who offers himself for training. Such a statement leads directly to another point. Since it is no longer possible merely to skim the cream off the labor market, the problem of allocation—fitting the right worker to the right job—assumes a new significance. In considering the problem of allocation, the relation of selection to training must not be overlooked. Skilled workers are scarce, at a premium, and subject to labor raiding. The nation is faced with a vast undigested mass of untrained workers, who must be trained as rapidly as possible in essential productive skills. Most of this training will take place in industrial plants in the form of in-service training.

Individual differences in the ability to profit from instructions are confused by differences in the type and quality of instruction and conditions

One of the tests for determining the aptitudes of workmen is the fitting of these wooden blocks in the right places.

Federal Security Agency Photo

under which the instruction is given. If these training programs are to be functional and adequate in terms of meeting threshold job requirements, then those individuals most likely to profit from such training programs should be selected in terms of their interests and potentialities, or to state this fact in terms of this present emergency, individuals should be placed in varying training programs in line with their individual qualifications. This is the essence of scientific allocation.

How can this problem of scientific allocation be solved? About a dozen of the larger progressive firms within the country have attempted to standardize their selection procedures through well-organized testing programs for some time. Another score have found such techniques more or less successful and sufficiently promising to be continued. But there are many factors which must be considered by personnel men before setting the wheels of a testing program in motion.

Unquestionably the development of a testing program on a large scale calls for a highly trained technician. Personnel of this type is rare. The highly trained and academically slanted technician who has never worked with his hands and is unfamiliar with job evaluation and motion study techniques is as woefully inadequate as a specialist in job evaluation with no training in the techniques of psychological testing. The need for highly trained personnel is particularly conspicuous when existing standardized tests are found inadequate and company-made tests are needed to solve special problems.

This statement should in no way dampen the ardor of the business executive or the far-sighted personnel man who earnestly seeks an improvement in his selection techniques. The specialist today who is broadminded enough to dispel the mystery of his profession has a new respect for the test "generalist" who has read avidly, sought the initial help of test consultants, and uses cautiously standardized tests which seem best fitted for his purpose.

However, a word of caution should be interjected at this point. The impetus given to the testing movement following the first World War caused many unqualified persons to use tests blindly and with unjustified conclusiveness. The result was an unfortunate set-back for the testing movement. Personnel men should not lose sight of basic testing principles in the face of the present crisis. The test generalist must move cautiously

Pencil-and-paper tests may be given to groups as well as individually

into a gradual understanding of the basic concepts of testing techniques; a little knowledge is often dangerous. The intelligent use of tests will give the personnel man a "feeling" of the meaning of test results in his own selection problems.

The test technician usually prefers to use the experimental method in developing testing procedures. This method differs from the more immediate clinical method in that the results are usually validated against work criteria. The maximum effectiveness and certainty of the experimental approach is, of course, more desirable, but in facing an immediate and pressing problem of selection, the initial use of tests based on so-called "face validity," without such experimental evidence is justified as a practical matter.

What kinds of tests are available for use in business and industry? Which, if any, are basic in any testing battery? A bewildering array presents itself. As to content they are usually referred to as interest tests, mental tests, clerical, mechanical, and temperament or personality tests. There are also many special-type tests in specific areas, measuring various phases of personality, practical judgment, and social intelligence.

Let us consider briefly the nature of these tests and the situations in which they are applicable. Interest tests in terms of historical development, are still comparatively new. They attempt basically to evaluate *attitudes* towards various activities. These may be everyday activities scored in terms of general patterns of interests, significant in generalized vocational groupings, or specific job activities characteristic of functional job patterns. Only a few such tests are sufficiently specific to aid materially in selection of trainees, but with *allocation* of trainees so vital today, no aid should be overlooked. Understanding the motivating *interests* of an individual is the best single prediction of the effort he will expend on the job. Fundamentally, an individual tends to do well what he likes to do.

Intelligence tests have unfortunately, from the industrial viewpoint, been developed primarily in the cloistral atmosphere of the schoolroom. Such tests are frequently statistical marvels, but practical nonentities in an industrial situation. These tests are generally overloaded with linguistic or verbal factors, although quantitative and non-language factors may form a better and more pertinent measure of intelligence in technical or industrial activity. The selection

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PUNCHED CARD METHOD OF RECORDING AND ANALYZING STATISTICAL MATERIAL

By

E. C. SCHROEDEL

One of the most perplexing problems which confronts the statistician and research worker is that of the best method of physically handling the data at hand in order to develop economically and quickly the reports from which final interpretations and conclusions can be drawn. Often, a bare minimum number of cases must be used because time, money and personnel are not available to do the job on the broad basis which would be most desirable. Furthermore, in the development of statistical reports for a research project, the conclusions arrived at by the presentation of the material in one way may make it necessary, in order to confirm or clarify the conclusions, to redistribute and analyze the data in different ways. Also, it is often desirable to investigate further certain aspects of a problem when the data already obtained are inconclusive. Furthermore, in a great many research projects exploring new fields, it is difficult when drawing up the plans for the study to anticipate all the detailed analyses which will be required eventually, so that when the work is completed it is found that important information has not been collected with the original data, or has not been analyzed in suitable form for arriving at definite conclusions.

These difficulties, of which all statisticians are aware, are the very reasons for the rapid development of the punched card as an efficient approach to this whole problem of recording and analyzing statistical information, because the punched card is a means of circumventing these difficulties which beset the research worker. This method is extremely flexible as well as speedy and accurate, and is, indeed, the only efficient way of handling large masses of data. The advantages of the method can be best explained by a short description of it and its applications.

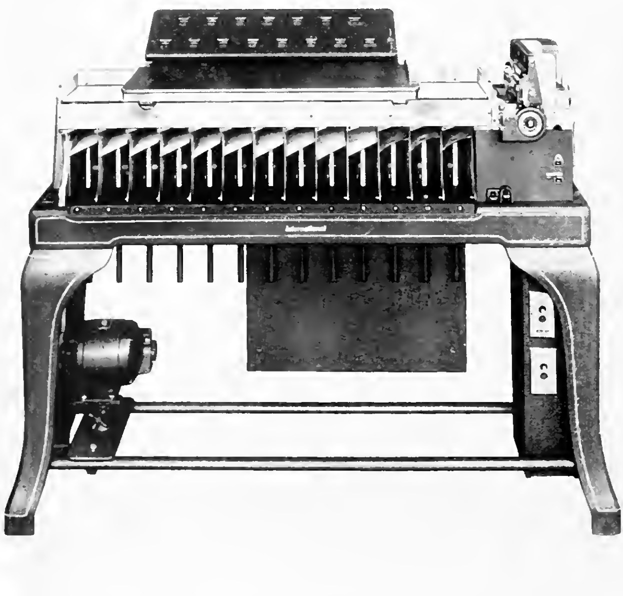
The punched card as a means of speedily and accurately analyzing statistical data was first developed about 1890, in answer to the need for a solution to the tremendous problem of tabulating data from the Federal population census, which, though much simpler than the census of today, still presented an almost hopeless task for any hand tabulating methods. The solution adopted was a unit record for each individual case, on which all information about that individual was recorded in the form of punched holes. It was found that these individual records lent themselves to rapid automatic sorting into different categories and tabulating or counting of the coded data. Continued development of the machines which performed these functions has led to the modern electric punched-card accounting machines which handle all of the analytical processes, from the original recording of data through the final summaries and preparation of printed reports, with remarkable speed and accuracy. These machines are used in every type of commercial and industrial business for producing statistical and accounting reports: they are used by government and education for accounting and statistical calculations, and they are playing an extremely important part in the contributions of Army, Navy, and industry to the defense program.

A typical punched card form is shown in Exhibit 1. This form has eighty columns of twelve positions each. Ten of the positions are for the digits 0 through 9 corresponding to the digits of the data to be recorded, while the other two are for identifying or classification punches. The card is divided into fields, indicated by the headings at top and bottom, in which the various types of information are recorded; any one item of information is always recorded in the same field of the card, its magnitude or description being indicated by the digit positions which are punched in that field. This particular form is drawn up to handle pupils' scores on a battery of tests, together with pupil name, number, age, class, and other identifying information which will be used in classifying the test scores.

The three basic operations in the punched-card method are handled by the three basic machines: punches, sorters, and tabulators.

Various types of punches are used to record data in the form of punched holes on the tabulating card. A simple punch with one key for each of the twelve positions on the card is used for recording numerical information. Alphabetic punches, with a keyboard resembling that of a typewriter and operated in a similar manner, record

IBM Alphabetical Printing Punch.



IBM Card Counting Horizontal Sorter.

both numerical and alphabetical data on the card in the form of punched holes. (For alphabetic information, two holes are punched in each column of the card, in different combinations representing the twenty-six letters of the alphabet.) Auxiliary features of the punches permit automatic punching of data common to a group of cards in all of that group of cards, printing along the top of the card the information which is at the same time recorded in punched hole form, automatic feeding and ejection of the cards, and other operations which speed up the recording or copying of information in punched-hole form. Verifying machines are used to prove the accuracy of the original punching of the data.

The sorting machine is used to classify and arrange the cards into any sequence or groups required for the analysis of the data. The sorting operation is based on the position of the punched hole in the column which is being sorted; the cards are separated into twelve groups, each including all the cards which are punched in the same digit position in the column on which the cards are being sorted. A sorting machine with card-counting attachment not only sorts the cards, but also simultaneously counts the total number of cards and the number of holes of each kind punched in the column on which the cards are being sorted.

The electric accounting machine (tabulator) summarizes the information punched in the cards, after they have been arranged by the sorting machine into the desired classifications, and prints a record of the tabulation. The information punched in the card may be added or subtracted or merely listed on the report; information punched in two fields may be selected or combined, or certain cards may be eliminated from the tabulation. All these operations are handled automatically by the machine, the punched holes in the cards actuating the adding, subtracting, selecting and printing mechanisms of the machine through electrical contacts made through the holes. Electric accounting machines are of varying capacities and speeds, but as many as eighty "counters" are provided for simultaneous adding or subtracting of different items, at the rate of 150 cards per minute. The various functions of the machine are controlled through a plugboard similar to a telephone switchboard, which makes it relatively easy to change from tabulations of one type to another, to print the summarized data in any desired order on the report form regardless of the ar-

rangement of the original data on the cards, and to set up the machine to provide any desired information from the cards which are being tabulated.

In addition to having the totals from the tabulation printed on report forms, it is possible to have these totals simultaneously reproduced in punched-hole form on summary cards, which can in turn be reclassified and summarized or studied in any desired way.

Supplementing these basic machines, auxiliary units perform other functions which add to the flexibility of the method and to its adaptability to many types of problems. Reproducing machines automatically transfer all or part of the punched data from one set of cards into another set, either in the same fields or in different fields of the card; or they automatically transfer certain data from a master card to a group of cards; or reproduce in punched-hole form information which has been recorded in the form of pencil marks on the cards. Multiplying punches multiply one field in the card by a factor punched in another field and punch the product in a third field, or perform different combinations of adding, subtracting and multiplying operations and punch the final result in the card. Collating machines compare two sets of cards, matching or merging them, or selecting certain cards from the file.

Whatever the statistical operations to be performed, they are handled automatically by the electric punched-card accounting machines, rapidly and accurately. One important feature of the method is the fact that it is possible to maintain much closer control on the accuracy of all operations than by any other method of analyzing mass data; once the original unit record has been made and verified, the information recorded on it is automatically sorted, added, or accurately handled otherwise without further checking. It is a simple matter to establish check-sums which verify the accuracy of all operations through which the cards pass.

As has been mentioned previously, the method also is characterized by extreme flexibility, in that it is a fairly simple matter to reclassify the original data, in order to prepare any tabulations which are indicated either in the original plan for the project or by the results of preliminary tabulations or calculations.

A printed report may be prepared from punched cards. The cards (Exhibit 1) on which test scores were recorded are tabulated to prepare frequency distributions for each of the test scores; percentile ratings corresponding to the various raw scores have been automatically assigned and punched in the card; then the "Report of Scores" is prepared by listing the information punched on the cards; student number, name and address, age, sex, etc., and test percentiles. Such a report may be printed at the rate of eighty lines per minute.

Other types of tabulation which might be made from the same cards are: sums of scores and numbers of pupils for calculating averages; sums of squared scores to be used in computing standard deviations; sums of cross-products to be used in computing intercorrelation coefficients. Each of these types of tabulations can be made for the total group, or for groups by age, sex, school, class or other classifications. An example of the capacity of the tabulator is that, in calculating intercorrelation coefficients, as many as ten cross-products may be accumulated at one time.

Wherever large masses of data must be analyzed, the punched card method is being used to expedite their study. In government, the analysis of census records has been a continuing application, to which have now been added countless other applications such as social security records, fingerprint files, trade and business and production statistics, rosters of personnel, and Army classification records. In the field of education, punched-cards methods are widely used in analyzing and summarizing the results of testing programs, in

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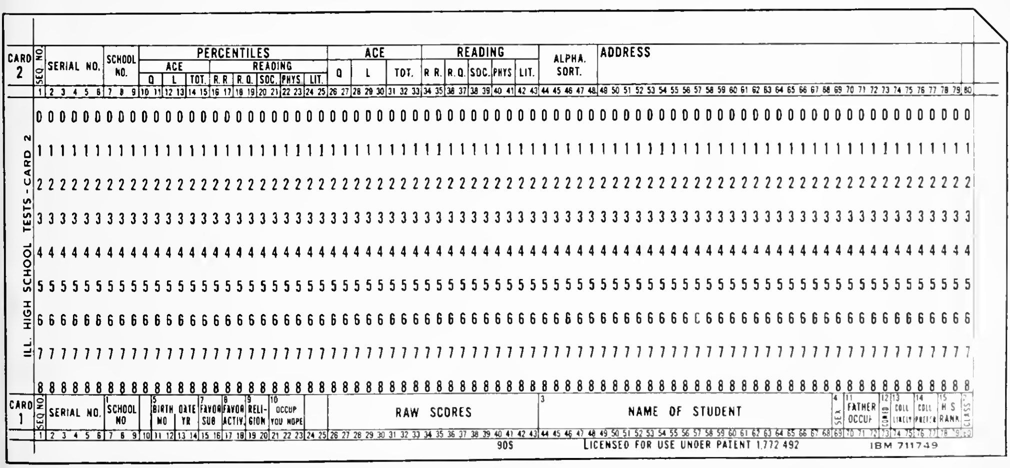
Exhibit 1. A typical tabulating card form.



A WOMAN OF THE EIGHTIES

By

JAMES C. PEEBLES

Whenever the opportunity offers, it is well, I think, for each of us to get out of the tumbling stream of events in which we are all immersed, and take time for a little quiet reflection. Upon such occasions, all too few for most of us, I fear, nonessentials are recognized for what they are, perspective is recovered, sanity returns.

In such a reflective mood just now I find myself thinking about the work of the historian. There is something about the unhurried appraisal of events, past and present, that broadens one's outlook and deepens his understanding. Time, it seems to me, is the perfect alembic; when events have been long exposed to its mellowing and purifying influence, the unimportant has been eliminated, the false has sunk out of sight, and at least an approach to truth has been recovered.

In my distilling flask today I have the events of ten years of time, a decade which has come to be known as the elegant eighties. Simmered in the heat of sixty summers, its vanities condensed in the chill of as many winters, it is an interesting object for study. The adjective *elegant* was richly deserved. To describe the language of public address, social manners and customs, ladies' apparel, and men's whiskers, no lesser word would have been adequate. In an era of extreme individualism the beard became an expression of individuality, and since there were mighty men in Chicago in those days, adequate self expression resulted in an array of hirsute adornment unmatched since the days of the patriarchs of old.

Peering intently into my simmering flask, I see what Chicago was like in the elegant eighties. Prairie, Indiana, and Michigan Avenues, between Twenty-Third and Thirty-Ninth Streets, comprised the city's gold coast. Perhaps Wabash Avenue, too, could be included; although not solid gold it was at least heavily plated. In this area lived most of the families whose names were associated with the commercial and industrial life of Chicago.

The region west of State Street was a typical middle-class neighborhood, inhabited chiefly by people of Scandinavian birth or parentage. The area had been growing rapidly, and, as often happens in such circumstances, educational and cultural advantages had not quite kept pace with the growth in population. The people were thrifty and hard-working, many owning the homes in which they lived. All were determined to get ahead in the new world and especially to see that their children had a better opportunity than they themselves had enjoyed.

The good people of the gold coast were pious folk, not unmindful of their devotions. Their church stood at Twenty-Sixth Street and Michigan Avenue, presided over by a pastor famous the country over for his pulpit eloquence. Many men of wealth and prominence were members of Plymouth Church, including Mr. Philip Armour and his brother Joseph. These two, together with other men and women of the community, mindful of the educational and cultural advantages which they enjoyed in Plymouth Church, determined to extend its blessings to their neighbors west of State Street.

A Sunday school was organized for the children of the region and housed in a rented building on Thirty-First street, recently vacated by a saloon. A total of twenty-seven people attended the first meeting. The school was given the name of Plymouth Mission, and meetings were held every Sunday afternoon for several years. Conditions made it necessary for the mission to move from one rented building to another, a very real handicap in the effort to create a permanent institution.

A lady member of Plymouth Church determined to do something about it. She was Mrs. Julia Beveridge, who had been interested in Plymouth Mission from its beginning. She succeeded in interesting Mr. Joseph Armour in providing the funds for the erection of a permanent home for the mission school. Mr. Armour's gift of $100,000 made the building possible, but the donor did not live to see the dream come true. After his death his brother, Mr. Philip Armour, continued the work, and the home of Armour Mission, as it was then named, was finished in 1886.

Doubtless the happiest and proudest among the five hundred people who assembled for the first meeting in the new Armour Mission on the first Sunday in December, 1886, was Julia Beveridge. She had a broad vision in mind as to what Armour

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NEW COOPERATIVE COURSES

By
KATHRYN JUDKINS

It is believed by many that we are facing a new era in education, an era in which education will mean more than the struggling for credits, diplomas, degrees, and other tokens of school achievements, an era in which education will mean a realistic preparation for life itself. Educators are making a serious effort to re-think the whole scene with reference to the fundamentals of good and efficient living, and the requisite training of youth to participate in them. One outgrowth has been the development of the cooperative program of training in school and training in industry.

About six years ago, a group of Armour men decided to "do something" about the fact that while many students have the opportunity for additional education and training with little effort, due to the economic background of their parents, other students find it necessary to earn their own way through school with very great sacrifice, either mental or physical or both. They saw that while individual work-patterns are satisfactory to a few individuals' requirements, a systematic plan of earning and learning is much more conducive to stability and continuance, both on the job and in school. The student's educational pattern, depending upon his requirements and ambitions, should be an exchange in which he can gain his ultimate goal to the best advantage. The decision to "do something" resulted in the establishment of the cooperative program for mechanical engineers.

The cooperative program provided a means for energetic and ambitious high school graduates to alternate between training on the job and related college work. Students were enabled to earn a large part of their college expenses by working half-time. Using the calendar year rather than the traditional school year of September to June, the completion of a four-year college course in five years was made possible. Business enterprises cooperating with this program are provided with a selected group of students whose services are valuable during their undergraduate years and who will be available for continued employment upon graduation.

This inaugural cooperative program was so highly successful, that in February, 1941, following the merging of Armour Institute of Technology and Lewis Institute into the Illinois Institute of Technology, another cooperative program was begun. This new program was developed in the field of business and industrial management after several months of development work, and the course has been in progress at the Lewis Division since that time.

Now, just one year later, the cooperative education program has been enlarged to include two new fields—chemistry and industrial engineering. The same principle of alternating periods of work and school is being followed in the administration of these two new courses, but the periods are sixteen weeks long instead of eight weeks as in the first two programs.

During the work period, chemistry students will be given an opportunity to develop in their own jobs by remaining for a longer period of time. Due to the nature of the work—research or analysis — that they will be doing, the training program can thus be more thorough and more satisfactory to both the employer and the student. The cooperative course in chemistry is designed to meet the needs of industry for college graduates who have obtained a fundamental training, and at the same time have acquired experience in the field by active work in the industries. The five-year curriculum includes a basic training in chemistry, physics, mathematics, and the cultural subjects necessary for a balanced education. In the class-room and the laboratory, the student becomes acquainted with the scientific method of approach to technical problems; and, on the job, he has the opportunity of learning the application of his technical training to the methods of industry.

The industrial engineering students will follow the same plan of a full semester of work and a full semester of school in alternate periods. This course retains a basic engineering training but substitutes for such specialized courses as power plant design a compact grounding in accounting, time study, labor management, and other studies which will provide a better group of business and industrial problems.

The scholastic requirements for admission to these two new cooperative courses are the same as for the Institute's regular four-year courses plus the additional qualification of a candidate's having maintained a scholastic standing within the upper twenty-five per cent of his high-school graduating class. A student should have had in high school three semesters of algebra, three of geometry, two of physics, and two of chemistry. Any of this work which is lacking must be made up before the candidate is admitted to the course. The applicant must also achieve good results in a group of standardized tests which are administered at either campus.

Students are paid at the regular wage rate for the kind of work done for the time they are at work, and their earnings should be such as to approximately cover the expenses of the school term. The tuition for each of the five years would average $240. Fees and text books will involve additional expense of about $75 per year. $150 tuition, plus the fees, is payable at the beginning of each semester.

The Institute makes no guarantee as to work or wages but uses every effort to place students to their best educational and financial advantage. The wages are paid directly to the students by the employers for the actual time on the job.

With the addition of chemistry and industrial engineering to our cooperative program of education, we hope that many more students will be able to fulfill their ambitions in the training program which best suits their aptitudes and interests.

BETTER MOUSE TRAPS

The armed forces of the world, as well as their supporting home industries, are constantly fighting an enemy far less spectacular in action but as destructive as bombs and torpedoes. While the guns are silent and the generals plan their next moves, corrosion continues to devour vital parts of the war machines, nibbling a little of the officers' brass buttons for dessert.

Corrosion of metals is not a simple thing. In its various forms it may result from contact with salts, acids, alkalis, organic chemicals, gases, atmospheric air, or even pure distilled water. The mere touch of human hands can do damage to fine surfaces. Where one metal can be attacked alone, two in contact are generally even more vulnerable because of the galvanic action set up.

Research in corrosion prevention calls for studies of the relative merits of different metals in specific applications, the possibilities of coating them with protective films, opposition of local electromotive forces and a dozen other factors. The best solution to one problem is frequently the poorest in another case.

Because corrosion problems always boil down to immediate practical application of whatever corrective measures may be found, it is essential that real performance tests be made. Accelerated test methods are essential, for otherwise research is intolerably prolonged. For purposes of standardization, laboratory workers have, over a period of years, relied upon what is known as the standard salt spray test. Yielding satisfactory results in certain cases, this method has been applied to corrosion problems in every field, and has given the world a veritable mine of misinformation.

Through contact with a diversified collection of industrial corrosion problems, it was recognized early by the Armour Research Foundation that in corrosion "one man's meat is another man's poison." No simple criterion could be established for the measurement of all forms of corrosive damage. Instead, these many different cases could be classified into a number of major groups, each with its own test methods. Proceeding upon this, the Foundation laboratories have developed various methods of corrosion measurement, based in each case upon an accelerated duplication of the conditions to which ordinary practice must subject the corroded parts. Some of these new tests involve interesting gadgets.

One very common cause of corrosion is ordinary exposure to weather. This involves periods of sunshine, wind, rain and frequently actual immersion in flood water or puddles. For purposes of acceleration of the effects, it is recognized that some of these factors are more severe than others and require emphasis in the test method. Comparative "outside exposure" tests in the Research Foundation laboratories are made by hanging sample materials on a motor-driven endless chain which carries them repeatedly through a complex cycle of conditions. After a short immersion the samples are dried by forced air,

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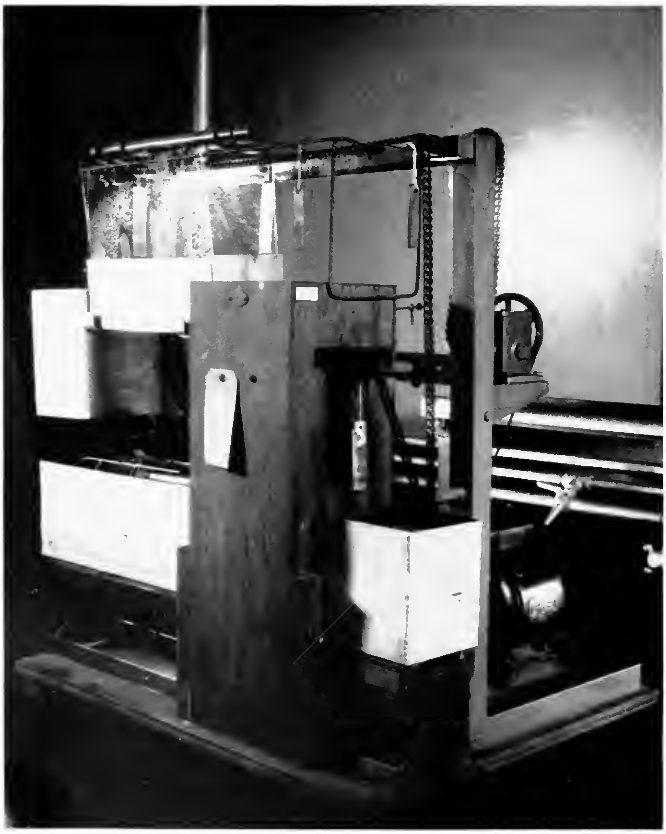

"Outside-Exposure" corrosion testing machine in Armour Research Foundation laboratories

The telephone plays a vital role in army communications. So the Bell System is helping to school Signal Corps men in practically every phase of telephone construction, operation and maintenance.

This training job is but a small part of the tremendous task Bell System people are doing in this national crisis. They're setting up telephone systems for new camps, bases and factories — handling an enormous volume of calls needed to coordinate the Nation's war effort.

Throughout the country, Bell System people are wholeheartedly cooperating in the drive for victory. To men and women of their high caliber, there is real satisfaction in a difficult job well done.

AMERICAN TELEPHONE & TELEGRAPH CO.
BELL SYSTEM
AND ASSOCIATED COMPANIES

OBITUARY

Bion J. Arnold, a trustee of Illinois Institute of Technology, died January 29, 1942. In his passing, Chicago and the nation lost an outstanding engineer.

Born in Michigan more than eighty-one years ago, early in life he showed his interest in mechanisms, and one of his youthful achievements was the building of a working model of a steam locomotive. Perhaps this was an indication of his instinctive turning toward problems of transportation, shown in later life by his notable work in the development of electric railways.

His formal education included undergraduate and graduate courses at Hillsdale College and graduate work at Cornell University. He held bachelor's and master's degrees from Hillsdale. In later life his important professional record was recognized by an honorary degree and diploma from Hillsdale, and by the honorary degree of doctor of science awarded by Armour Institute of Technology. Throughout his life he continued to be interested in education; he was a trustee of Lewis Institute, and after the consolidation of Armour and Lewis became a trustee of the enlarged school.

It was during the World's Columbian Exposition at Chicago in 1893 that Mr. Arnold's engineering first attracted general public attention. Here he was engineer for the Intramural Railway which first used the third rail and which was the first elevated electric railway in this country. That was in the days when horse cars and cable cars were still used in Chicago.

From this time on Mr. Arnold was very active in electric transportation. In 1902 he was commissioned by the city of Chicago to study the traction problem of the entire city. This was followed by the rebuilding of all the surface lines and the installing of an all-electric unified system. A board of supervising engineers was created by the city to look after the operation of the revised system and Mr. Arnold was made chairman of this board. Mr. Arnold was also appointed chief subway engineer and made comprehensive plans for subways in the downtown district of Chicago.

Many other cities secured the services of Mr. Arnold in connection with their traction problems. Railroad companies also consulted him. His plans for electrification were adopted by the New York Central and he was a member of the commission that carried out the electrifying of this railroad within and outside of New York City. He also planned the electrification of the Grand Trunk Railway's St. Clair Tunnel.

Mr. Arnold recognized his obligation to professional and scientific societies and was an active member of several such associations. In turn these societies recognized his ability. As evidence of this he was elected president of the American Institute of Electrical Engineers; he served also as president of the Western Society of Engineers. He was a delegate to the International Electrical Congress in Paris. In 1929 he was the recipient of the Washington Award for outstanding work in electric transportation.

Mr. Arnold also recognized his obligation to his country. During the first World War, he served as Lieutenant-Colonel in the aviation section of the Signal Corps. He was in charge of airplane production, but also carried out other assignments, including a study of the requirements for aluminum in the Army and Navy.

The characteristics of the pioneer ancestry of Mr. Arnold were evident in his work throughout his life. He possessed the self-reliance and resourcefulness so necessary in that class. He attacked his problems with freshness, vigor, and imagination to find new and better ways of doing things. He succeeded in a masterly way, and his successes will be long remembered.

Ernest H. Freeman.

THE ENGINEER STAFF

Arthur H. Jens, '31, who has been the efficient alumni editor, has been appointed an associate editor. His responsibility is, as it has been, for the alumni portion of the magazine. With the progressive development and improvement of the Institute's alumni office, much of the detailed information about activities of our graduates will be tabulated by that office under the direction of Arthur E. Wright, executive secretary of the Alumni Association. This tabular material will be cleared through Mr. Jens, who will also prepare *The Man Of The Month* and other feature items in the alumni section.

Sanford B. Meech, associate professor of English, has been appointed associate editor. His duties as a member of the magazine staff are not restricted; it is our confident expectation that his assistance in all editorial duties will be of great value.

Lee C. Higgins continues her competent service as business manager, in charge of advertising and circulation.

Our staff is small. Valuable help has been given by volunteers from the student body and from the alumni. The editor considers that we are fortunate in this help, and particularly fortunate in having Mr. Jens, Doctor Meech, and Mrs. Higgins as our regular staff.

FORTY-SEVENTH COMMENCEMENT

The mid-year commencement of Illinois Institute of Technology, which was the forty-seventh commencement of Armour College of Engineering, was held in the auditorium of the Museum of Science and Industry, January 28, 1942. The commencement address was by Raymond J. Koch, president of Felt and Tarrant Manufacturing Company, and a trustee of the Institute.

The B.S. degree was conferred upon sixty-six graduates in the department of mechanical engineering, three in chemical engineering, one in civil engineering, and two in electrical engineering. Of the mechanical engineers, sixty-four were graduates in the five-year cooperative course, and constituted the second group of such graduates.

The M.S. degree in chemical engineering was awarded to one graduate student, the M.S. degree in electrical engineering to one, the M.S. degree without departmental designation to two, and the Ph.D. degree in civil engineering to one.

GOODBYE 200! I'LL NEVER MAKE IT NOW!
GET "33 TO 1" FIRST... AND IT'S A CINCH!
WHAT SMART-ALECK MADE THAT CRACK? I'M IN NO MOOD FOR JOKES...
THAT'S WHAT AILS YOU, BILL. DON'T BLOW UP... EASE UP WITH A "33 TO 1 FRAME"...
HERE IT IS... YOUR SET-UP FOR A TOP SCORE IN REFRESHMENT ...GOOD OLD PABST BLUE RIBBON!
M-M-M! IS THIS GOOD! BUT WHERE DOES THE "33 TO 1 FRAME" COME IN?
RIGHT HERE-33 FINE BREWS BLENDED INTO 1 GREAT BEER! BLENDING'S WHY IT TASTES SO GOOD!
• FLAVOR! EXTRA-DELICIOUS FLAVOR... BECAUSE PABST BLUE RIBBON, LIKE FINEST CHAMPAGNES, REACHES PERFECTION THROUGH BLENDING. IT'S SPECIALLY BLENDED, "33 TO 1."
A LITTLE LATER
WHAT A COMEBACK! HE BEATS ME BY 20 PINS!
ZOWIE-200! THAT LUCKY "33 TO 1 FRAME" SURE DID THE TRICK!
WHEW! THAT'S WHAT I CALL A BLUE RIBBON PERFORMANCE!
Friendly Pabst Blue Ribbon *always* scores you tops in refreshment. The reason? Extra-delicious flavor that only the blending of 33 fine brews can bring you. This has made it a favorite everywhere, and the leading beer in the homes of all America.
Enjoy it in full or club size bottles and on draft at better places everywhere.
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HELP!

HELP!

HELP!

A request from a government source has just come into the placement office requesting the names of our electrical engineers, radio engineers and those with experience in communications, that are in the service. It is expected that before long the names of engineers from our other departments, in the service, will be requested.

This office long ago asked you alumni to keep us posted if you go into the service Thus far about seventy-five men have been thoughtful enough to do this. Will you now take the time to let us know if you are in service, or will the fathers, mothers, or relatives who read this article please inform us?

Some of the draft boards are becoming very strict with engineers and are sending them into the Army via the selective service draft. If you are doing defense work and you are placed in 1A have your employer appeal your case. You have but ten days to do this after notice of your classification has been sent. This procedure is not unpatriotic, but on the contrary it is the patriotic duty of your employer to aid and speed the production of all articles of offensive and defensive warfare. If you are inducted in the service as a private write immediately to the Chief Engineer of the U. S. Army, Washington, D. C. Tell him about yourself and that you would like the necessary forms to apply for a commission. While obtaining your basic training, work cheerfully and hard, with plenty of studying on the side. A good word from your officers aids much when you are applying for a commission in the Army.

Since the first week in December, this office has been flooded with requests for engineers. The Navy wants fifty to sixty thousand engineers as ensigns during the next few years. If you are interested write to us and you will be sent the Navy's proposition. It is a good one.

Interviews are now going on for the 1942 class, which will graduate in May. Many industrial firms have been at college interviewing the lads who are soon to bid farewell to their alma mater. Many other interviews are to take place in the near future. Letters arrive from all over the country asking for our men who are about to graduate, and for alumni with experience.

The department is especially interested in men with special attainments; they are needed for government work. If you are a good mathematician, speak and read a foreign language or two and have a flair for unraveling mysteries or solving puzzles or have a knowledge of cryptography let us hear from you. Also, men who are excellent photographers and have a sense for camouflaging or colors should write to us.

The Bureau of Yards and Docks, Navy Department, is in need of graduates for design and construction of personnel buildings such as administration offices, barracks, hospitals and quarters; magazines for storing powder, hangars for airplanes and airships, submarine training tanks, radio towers, oil storage equipment, water tanks and reservoirs; floating equipment, seawalls, piers, wharves and causeways, airplane landing fields; sewage disposal and water purification plants, power plants, power and steam distribution; roads and walks. The positions pay from $2,000 a year up, depending on experience.

These positions call for structural engineers; mechanical engineers for power plants, refrigeration plants, and heating and ventilating; electrical and sanitary engineers. There are some openings also for safety and fire protection engineers. If you are interested, write to us and you will be told to whom your application should be sent.

The Chicago Ordnance District is looking for men and women for all sorts of jobs. The department is especially in need of women personnel and needs about 800 additional people. The need is for people qualified in negotiation, production, and inspection. The Ordnance Department is especially interested in men that can be deferred, and in women trained in engineering or related work.

The Maritime Commission is looking for architects, mechanicals, civils, and electricals for marine engineering. These candidates will take a training course for six months or so and then will be assigned to all kinds of work involving the design and construction of cargo ships and war craft of all kinds.

The Navy, at Great Lakes, is also looking for chemical engineers experienced in plastics, petroleum products and in various other fields.

Some airplane manufacturers are looking for personnel.

There are jobs available in defense plants for all sorts of engineers. Write us immediately for leads.

Our office hours are from 2:00 P. M. to 4:00 P. M. Monday through Friday, or, at other times by appointment.

John J. Schommer.

The heat treatment that contradicted itself

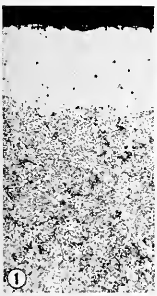
How Westinghouse Engineers straightened out a paradox in steel

METALLURGISTS have been heat-treating steel for 2,500 years. They've taken steel parts, subjected them to heat, cooled them quickly by quenching them in water, oil, or gas, and so hardened them.

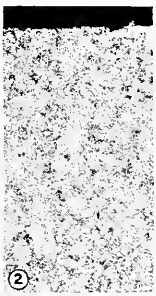
But the heat treatment contradicted itself.

For while they were heat-treating the steel to harden it . . . they also softened it. As the steel was being heat-treated, oxygen combined with the surface carbon, decarburized and softened the surface.

Naturally, metallurgists had to remove this softened surface. They had to pickle, grind, or machine the surface—processes



This photomicrograph of SAE-6150 Spring Steel shows .005" decarburization with ordinary scale-free atmosphere.



This photomicrograph of SAE-6150 Spring Steel shows no decarburization with Endogas atmosphere.

which not only wasted time and cost money but also accounted for a whole lot of inefficiency.

The dimensions of many steel parts, especially dies, have to be accurate to a few thousandths of an inch. So, metallurgists had to make the steel parts larger to start with, just enough larger so that they'd be the right size after the softened surface had been removed. And that left room for plenty of mistakes.

▸ Something, Westinghouse engineers decided, should be done to get rid of all this heat-treating trouble.

They figured the thing to do was to find a way to keep carbon-hungry oxygen from getting at the steel surface. And that was the thing they did.

First, they settled on using an electric furnace since it would give them accurate temperature control and entirely eliminate gas fumes. Then, they created a special atmosphere for the furnace. They heated ammonia (NH_3) in the presence of a catalyst and separated it into its component parts, nitrogen and hydrogen. The nitrogen is inert and won't combine with anything. The hydrogen, in the absence of oxygen and water vapor, also refuses to have anything to do with the carbon.

In this special atmosphere, which Westinghouse engineers called Ammogas, steel parts could be treated with electric heat and . . . no softening of the outer surface took place, no time-wasting, inefficient finishing had to be done. The dies and other steel parts came out of their heat treatment bright, shiny, all ready to use.

▸ The Ammogas furnace that Westinghouse engineers created took care of the heat-treating of costly parts like dies, which can be gas-hardened and are not produced in great quantities. But Ammogas is expensive—too expensive for

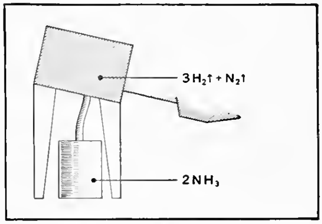
Here is an Ammogas Furnace.

the ordinary heat-treating of thousands of machine parts. And it is not suitable for heat-treatments requiring high temperatures.

So Westinghouse engineers developed Endogas—a special atmosphere which would do large-quantity, high-temperature heat-treating jobs, and do them at low cost. They heated ordinary gas (natural or manufactured city gas is all right) and, by a special but inexpensive process, changed it into a gas rich in hydrogen and carbon monoxide and containing a little water vapor and carbon dioxide.

Endogas doesn't do its work by *avoiding* all decarburizing agents, carbon dioxide and water vapor; it *overpowers* them by the inclusion of agents like carbon monoxide and methane that work in the opposite direction.

In effect, Endogas maintains a balance between carburizing and decarburizing forces. This balance can be so closely controlled that it is even possible to *add*



A diagram of the Ammogas furnace.

carbon to the steel that's being heat-treated.

Today, the Ammogas and Endogas furnaces are hard at work heat-treating dies, castings, airplane parts, steel parts of all kinds, helping to turn them out faster and better—saving industry time, money, and mistakes—speeding crucial war production.

★ ★ ★

There is one reason why Westinghouse was able to create controlled atmosphere furnaces and lick decarburization. It is because Westinghouse is an engineer's company.

There are 3,500 engineers in Westinghouse . . . in service, in sales, in design, in research, in management, in every branch of the business. Engineers hold key positions in each of the 17 Divisions of the Westinghouse Company.

Engineers determine our ability to find better ways to get jobs done. Engineers direct the creation and manufacture of our products. Upon engineers our success depends.

Behind our training and our encouragement of individual effort, there is a definite purpose. Behind our organization set-up of many divisions, which are like small companies within a company, there is a definite purpose. That purpose is to develop young engineers like you into the kind of engineers who will take good care of our future.

Westinghouse

"An Engineer's Company," Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

MIDWEST POWER CONVENTION

APRIL 9-10, 1942

PALMER HOUSE, CHICAGO

The need in the present war effort is for POWER, and even MORE POWER. It is therefore the hope of the Conference Directorate that the 1942 meeting will provide a stimulus to the production of power in the present emergency.

Preliminary Program

Thursday, April 9, 1942:

9:00 A. M.—Registration. Palmer House, Chicago.

10:15 A. M.—Opening Meeting. M. P. Cleghorn, Chairman.

(a) Address of Welcome. H. T. Heald, President, Illinois Institute of Technology.

(b) Response for the Cooperating Institutions. A. A. Potter, Dean of Engineering, Purdue University.

(c) Power and the War Effort. Leland Olds, Chairman, Federal Power Commission, Washington, D. C.

(d) Prevention of Steam Losses and Fuel Waste in the Present Emergency. V. G. Leach, Chief Combustion Engineer, Peabody Coal Company.

12:15 P. M.—Joint Luncheon with A.S.M.E. C. C. Austin, Chairman.

2:00 P. M.—Central Station Practice. J. R. Michel, Chairman. (Sponsored by the Power and Fuels Division, Chicago Section, A.S.M.E.)

(a) C-E Controlled Forced-Circulation Boiler, at Somerset Station of Montaup Electric Co. F. H. Rosencrants, Vice President, Combustion Engineering Company, Inc., New York.

(b) Maximum Output from Existing Power Plants. E. G. Bailey, Vice President, The Babcock and Wilcox Company, New York.

(c) Discussion.

3:45 P. M.—Electric Power Transmission, Session No. 1. E. W. Kimbark, Chairman.

(a) Recent Field Experience with Natural Lightning. Chas. F. Wagner, Manager, Central Station Engineering, Westinghouse Electric and Manufacturing Co., East Pittsburgh.

(b) Lightning-Proof Line Design. A. C. Monteith, Manager, Industry Engineering, Westinghouse Electric and Manufacturing Co., East Pittsburgh.

(c) Discussion.

6:45 P. M.—"All Engineers" dinner. Informal. Red Lacquer Room. (Ladies invited).

Friday, April 10, 1942.

9:00 A. M.—Industrial Power Plants. H. L. Solberg, Chairman.

(a) Power in the Flour Milling Industry. A. R. Ulstrom, Engineer, Cereal Engineering and Construction Company, Minneapolis.

(b) Feedwater Treatment in Small Power Plants. Everett P. Partridge, Director of Research, Hall Laboratories, Inc., Pittsburgh.

(c) Power Recovery Installation as Developed by Buick Motor Division, General Motors Corp., Melrose Park, Illinois. C. A. Chayne, Chief Engineer, Buick Motor Division, G. M. C., Flint, Michigan.

(d) Discussion

9:00 A. M.—Electrical Power Transmission. Session No. 2. Hugh E. Keeler, Chairman.

Subject. Recent Developments in the Prevention of Outages on Transmission Systems.

Topics Included: Ground Fault Neutralizers, Protector Tubes, High-Speed Reclosing, High-Speed Relaying.

Speakers:

J. R. North, Assistant Electrical Engineer, Commonwealth and Southern Corp., Jackson, Michigan.

W. A. Lewis, Director, School of Electrical Engineering, Cornell University.

J. E. Hobson, Director, Department of Electrical Engineering, Illinois Institute of Technology.

Discussion.

10:45 A. M.—Hydro Power. J. W. Howe, Chairman.

(a) Silting of Water Power Reservoir. E. W. Lane, Professor of Hydraulic Engineering, The State University of Iowa.

(b) Engineering Features of the St. Lawrence River Project.

(c) Discussion.

12:15 P. M.—Joint Luncheon with the A.I.E.E. K. V. Glentzer, Chairman.

Speaker, H. W. Eales, Chief Electrical Engineer, Public Utility Engineering and Service Corp., Chicago. "Preventing and Extinguishing Electrical Oil Fires."

2:00 P. M.—Boilers and Stokers. Ben G. Elliott, Chairman.

(a) Results Obtained by Spreader Stokers with Continuous Ash Discharge. R. N. Bucks, Superintendent of Power Plants, The Studebaker Corporation, South Bend, Indiana.

(b) Steam Boiler Circulation. A. A. Markson, Member A.S.M.E., New York

(c) A paper by A. W. Thorson, Coal Research Laboratory, Carnegie Institute of Technology.

(d) Discussion.

3:45 P. M.—Diesel Power. R. E. Summers, Chairman.

(a) Radial Diesels. E. T. Vincent, Professor of Mechanical Engineering, University of Michigan.

(b) Diesel vs. Steam Locomotives. Robert Aldag, Jr., Member of Engineering Staff, Chicago, Burlington and Quincy Railroad Co.

(c) Discussion.

For further information, address Stanton E. Winston, Conference Director, or Charles A. Nash, Conference Secretary, Illinois Institute of Technology, 3300 Federal Street, Chicago, Illinois.

THE BOOK SHELF

NATIONALISM AND POETRY

A Revolution in European Poetry, 1660-1900, by Emery Neff. Columbia University Press, 1940.

Goethe's Faust, by Carlyle F. MacIntyre. New Directions Press, 1941.

Five centuries of bitter nationalism have flowered in world-wide war. Under the driving tide of conquest old boundaries of states and empires crumble. Yet if ancient walls are sundered, against the imminent deadly breach new unities perforce arise. And on these new unities, forged in the heat of war, rest the hopes for future peace. Of the blind nationalism that has brought such cruel dislocation there has been much criticism. Even those who in their hearts favor the cyclic course of nationalism, imperialism, the balance of power, and war, are, in the press of circumstance, forced to condemn it for the moment. Cosmic irony decrees that in conflict we solve the problems that we could not solve in peace. For victory demands unity, not only within nations, but among nations. Unity, in turn, demands a community of ideas and ideals, of gods and goals, such as this world has never seen before. And who can think that, after the present crisis, these new bonds among peoples can safely be dissolved and the self-centered nations of the past be permitted to emerge again?

Peace, too, demands its unity, for without unity peace cannot endure. Education, the instrument of peace and unity, has in the past been as blindly nationalistic as have the individualistic states. Literature has been fenced about with Chinese walls. Far from promoting knowledge and unity, such a compartmentalized method of study has produced compartmentalized intellects, learned in the language and literature of one nation, ignorant of all the rest. The criticism that is leveled against political nationalism can also be leveled against educational nationalism; each is equally destructive of unity and peace. Just as the world, to survive, requires some kind of supra-national unity so the study of literature, if it is to continue as a worthwhile discipline, requires a supra-national approach.

Unfortunately, there are few studies in literature which rise above national boundaries. Emery Neff's recent book on European poetry is a welcome contribution to this field. By tracing the changes that have taken place in poetry in the last three centuries, Mr. Neff gives much more than a supra-national history of poetry. He gives also an excellent insight into the workings of the modern mind. He treats poetry as an index of the changes of men's attitudes, and from it produces an illuminating account of the rise of the split personality, the schizophrenoid mentality which divides modern man into a Richard Yea-and-Nay. This division, with its resultant disillusionment, was more than an isolated phenomenon. It occurred in all the nations of Europe, and Mr. Neff has wisely disregarded national boundaries in assembling his material.

Mr. Neff begins his study of European poetry at the court of Louis XIV. France dominated the civilized world, and through its domination spread its culture throughout England, Germany, Italy, and Spain. But the author is less interested in defining French formalism than in suggesting the forces that modified it in certain directions. In six brief and readable chapters he takes up successively certain innovations that modified formalism and traditionalism into something new and strange. First among these forces was a new interest in folk poesy, ballads, and primitivistic literature. This was the equivalent in poetry of that distaste for aristocratic society which fostered our American revolution. Next was a perception of the importance of human brotherhood, latent since early Christianity, but entering into a new phase in the revolutionary era in which we still live. In poetry this sharp contrast between freedom and tyranny can be seen in a new emphasis upon the common people, upon intellectual liberty, and upon Utopian idealism. In history it was the era of the American and French revolutions, the English emancipation, and Italian and Greek liberation. A third impulse came with the revival of Hellenism, both in the renewed study of Greek archeology and thought and in the interest in the Greek war for freedom. Again, a new curiosity about nature, paralleling the development of natural science, brought to poetry a spiritual and philosophic depth which it had previously lacked. The next, and least satisfactory, chapter of the book, takes up that "Wonder" which Neff defines as "a desire for the remote, the exotic, the indefinite, the mysterious," but which he fails adequately to illustrate. This yearning for a glory not of this world, together with the other four impulses, tended to make modern man a creature of divided aims. The singleness of purpose which, supposedly, characterized the Greek warrior-citizen, the medieval scholar-priest, and the Renaissance courtier, have given way to a split personality. As Heine said:

> Once the world was whole, in antiquity and in the Middle Ages; in spite of superficial struggles there was always an inner unity and there were integrated poets. We honor these poets and rejoice in them, but every imitation of their unity is a lie that every sound eye penetrates.

On this note of inner division, characteristic of modern man, Mr. Neff concludes his excellent survey of European poetry.

All these five forces are summed up in the poetic career of Goethe, and make him the representative writer of the modern era. In *Faust* this lack of integration between man's hope and man's fate finds its most complete expression. Goethe provides also the best modern attempt at reconciliation between idea and reality. Faust, having much but desiring more, is fated never to be wholly satisfied. Yet in his continual striving for new sensations, higher satisfactions, and more adequate integration of his desires, Faust finds, so far as it is given man to find, the secret of life. In striving, says Goethe's God, is man's glory; attainment is nothing. This world of flux and change and evolution demands from man a continual activity, corresponding to but somehow rising above that change.

Fortunately, a new and readable translation of *Faust* has just appeared. C. F. MacIntyre, a poet in his own right, has draped a colloquial, even vulgar, garment of American speech upon the dried bones that other translators have left. Reacting violently against the Victorian type of translation which rendered Bayard Taylor's *Faust* so stiff and maidenly, Mr. MacIntyre is abrupt, masculine, and profane. In his mouth Goethe's ease often becomes current American slang, the manifold rimes sometimes become puns and jingles, and the jests savor somewhat of the smoking room. Yet, in spite of its occasional lapses, the version is tremendously alive. The lyrics are better done than ever before. The conversation is real. The obscurities of the original are intelligently handled. Moreover, the format is excellent, the print large, and the illustrations by Rockwell Kent are worth the beholding. For an American reader a few more notes might have been desirable, but New Directions was wise in refusing to make another scholarly publication. For the *Faust*, especially in this translation, deserves to be widely read by those who make no pretence to scholarship. Such reading would be one step toward supra-national understanding and unity.

F. R. White.

Chemical Engineering for Production Supervision, by David E. Pierce. McGraw-Hill Book Co., 1942.

In evaluating this latest and weakest member of the Chemical Engineering Series one must define the use to which the book is to be put. This is done by the author in the very first paragraph of the preface. Printing a book "for the nontechnical men of the chemical industry—for the foremen and supervisors in direct charge of operating chemical engineering equipment" and calling the book one on chemical engineering may seem to many to be a lowering of the dignity of the profession. Given a different and less pretentious title and limited to the level indicated above, the book might serve a useful purpose in our war effort. But a book should be either one thing or the other. Other texts serve the student who has successfully completed two years of college work. This one should serve the man who never went to college and evidently is meant for the use of such men. But much of the material requires a bit more knowledge of chemistry, physics and mathematics than such a student would possess. To do the job well it would seem that he should be first given work in chemistry, physics, and mathematics of a nature to allow him to perform a bit more work on the unit operations, so that the whole is not crowded into a single short course.

The lack of a suitable yardstick to measure the success of some of our rapid-fire, high-pressure courses in the Engineering, Science and Management Defense Training program is becoming more and more apparent. The graduates of a course using this book could not be called chemical engineers, but they must certainly be more valuable to their companies as a result of the course. A slower but more advanced program of training would be more likely to help them attain higher positions at higher remuneration and to do so on a more solid foundation.

The proof of the pudding is the eating thereof, and the success of the book by Mr. Pierce will have to be measured by the success of the men who use it as a text. Only time and experience can give us the answer, but a revision of the text in the near future seems to be indicated.

Robert C. Kintner.

Chemical Engineers' Handbook; John H. Perry, Editor-in-chief. McGraw-Hill Book Co. New York. Second Edition, 1941.

A handbook of engineering must serve two major purposes. It must be a reference book where the engineer can hopefully look for data upon all but the most obscure cases and it must indicate in skeleton form the method of utilization of the data to arrive at a rational conclusion or a sound design. The new second edition does this to a far greater degree than the old. The enlarged staff of writers and consultants is almost a complete *Who's Who in Chemical Engineering* and the entire profession owes a heartfelt vote of thanks to all these men for their labors in collecting, sorting, and condensing so enormous a mass of material into such convenient form.

The first five sections covering mathematics, physics and chemistry both as to general principles and data on the various chemical engineering materials are beyond reproach. It is a very difficult matter to determine just where to draw the line at completeness in such subjects and it would be impossible to please everyone. For example, this reviewer sees no advantage in changing the fine classification of types of nomographic charts set forth in Joseph Lipka's *Graphical and Mechanical Computations*.

Our teachers of hydraulics or fluid mechanics would do well to study the section on flow of fluids, for therein is developed the point-of-view and the field of knowledge that have caused much criticism by the chemical engineering teachers of fluid-flow courses taught in other departments. The same might be said of section seven on the flow of heat. The chapters on evaporation and humidification are adequate but not impressive. The addition of extraction to the section on gas absorption is a laudable one. The grouping of the leaching of a solute from a solid by a liquid and of liquid-liquid solvent extraction with gas absorption does not seem wise to your reviewer. It were better to place these in another section, as must eventually be done. Their only common phenomenon lies in the basic principle of diffusion, and solvent extraction has far more in common with distillation than it has with gas absorption. From the viewpoint of the industrial user of the handbook, the chapter on adsorption by C. L. Mantell is probably better written than any other. The multicomponent calculations on distillation will be pleasing to young petroleum technologists but the invaluable short-cuts of Brown, Thiele, Smith, and others are conspicuous by their absence. One could wish for more completeness and for some data on systems involving fractional crystallization of salts from solutions, including reciprocal salt pairs.

In many of the operations carried on by chemical engineers, the development of excellent machinery for a task preceded any adequate theory on the subject by many decades or, in some cases, by many centuries. In such cases it is only natural that anything except data obtained from full scale plant installations is looked upon with suspicion. The editors wisely turned these chapters over to men of long experience with industrial installations and one can use their empirical results with considerable confidence if proper care be used in evaluating the conditions involved.

The tremendous variety of operations, equipment, and materials used in the chemical industries and the accompanying complications of chemical changes retarded the issue of a handbook in this field until the organizing ability of Dr. Perry could be

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NEW ALUMNI SECRETARY

Early in December, 1941 President Heald announced that Arthur E. Wright, a 1941 graduate of Illinois Institute of Technology, had been selected as executive secretary of the Illinois Tech alumni association.

Wright was born in Whiting, Indiana on February 26, 1914 and attended primary schools in Houston, Texas and in Chicago. He began high school at Tilden Tech in Chicago but at the end of his first year left school to take on a full-time position. He continued his schooling at Englewood Evening School and was graduated in 1934. He began his college work at George Williams College and later entered the American College of Physical Education from which he was graduated in 1939. In this year he entered the Lewis Division of Illinois Tech and was graduated with the class of 1941.

While at George Williams College he acted as recreational leader at the University of Chicago and during summer vacations was waterfront director at the Michigan State Y.M.C.A. camp. For a short time he was a clerk in the U. S. Post Office in Chicago. After graduation from Illinois Tech he became an officer in the Bureau of Prisons, Department of Justice, and left this position to become associate physical director at the Indianapolis Y.M.C.A.

During his career Wright has had various selling positions and his work has constantly kept him in touch with people. This background should prove valuable in the conduct of the Illinois Tech alumni office.

THE AMERICAN MATHEMATICAL MONTHLY

The offices of the department of mathematics are a hive of activity these late winter days. In addition to their usual function as the nerve center of a large department, these quarters on the third floor of Chapin Hall have become the editorial offices of one of America's leading mathematical journals. On the door of 320 Chapin the passerby reads the inscription in large letters. THE AMERICAN MATHEMATICAL MONTHLY.

The MONTHLY was founded in 1894. In 1916 it became the organ of the Mathematical Association of America and it has since been published by that organization. It appears ten times a year and makes an annual volume of between 700 and 800 pages.

The editor-in-chief is selected by the board of governors of the Association for a five-year term. Last year Dr. Lester R. Ford, chairman of the department of mathematics, Illinois Institute of Technology, was selected for the period 1942 to 1946, inclusive. His duties began with the January, 1942, number.

So large an undertaking as the publication of the MONTHLY requires the assistance of many men. Dr. Ford has selected a staff of eighteen associate editors for this work. Important among them is Professor Watson M. Davis, Illinois Institute of Technology, who has charge of proof reading, make-up, and general typographical details. Professor Davis has had experience in a newspaper office and is exceptionally qualified for this work. Other editors from this area are Professor E. J. Moulton of Northwestern University, retiring editor-in-chief, and Professor M. R. Hestenes of the University of Chicago. The remaining editors hail from Brown University, Cornell University, Drury College, Haverford College, University of Iowa, University of Missouri, Pennsylvania State College, Sophie Newcomb College, University of Toronto, Washington University, Western Reserve University, and University of Wisconsin.

An examination of the January number indicates the varied character of the publication. There are half a dozen research papers on such subjects as *Heat Flow and Non-Euclidean Geometry, Four Finite Geometries,* and *On Frequency Distributions of the Quotient and of the Product of Two Statistical Variables.* There is an article on how to play the game of Nim and another entitled *A Night with Probability* which considers the games of chance at carnivals and in dens of vice. There are reviews of recent mathematical books and there is a flourishing department of *Problems and Solutions.* Roughly half of the contents of the MONTHLY consist of mathematical research.

It is a desirable thing to have the name of our institution associated in many minds with a learned journal. In its year and a half of existence the Illinois Institute of Technology has been making an honorable name for itself. It will help in this process to have the very heavy editorial correspondence of the MONTHLY to all parts of this country and to foreign climes bear the name of our school. After five years the name of the Illinois Institute of Technology will be associated with mathematical progress in every hamlet in which resides a mathematician.

THE SCHOOLMASTER

Why should we call uncultured the man who knows thoroughly and broadly the history, philosophy, and effect on the human race of the heat engine but is unfamiliar with the music of Brahms, while we hail as cultured the musician who is a master of technique and knows the field of harmony, but is contemptuously ignorant of applied science which has made possible the pipe organ?

Probably I should be able to give proper credit for that quotation, but I cannot. First it came to me from an old friend and fellow teacher, Fitzhugh Taylor. Second, much later, it came again from a young woman, very dear to me, who, curiously enough, has done creditable university work in the diverse fields of household economics and of scholastic philosophy.

Years ago I read an article by Jimmy Peebles. (You know him now by a dignified academic title.) He was distressed because some young engineers were missing their opportunities; he wrote for them some good advice, under the ironic title *Us Engineers Don't Need No English.* The irony was deserved. There are en-

(Turn to page 51)

FROM YEAR TO YEAR

A RECORD OF OUR ALUMNI AROUND THE WORLD

BOLTE

MEN OF THE MONTH

STRAIN

Photo by U. S. Army Signal Corps

Again the *Engineer* is privileged to present a dual nomination for the Man of the Month. The nominees, although both in the tremendous effort to place this country on a war footing, are engaged in different fields. Brigadier General Charles Lawrence Bolte, Ch.E., '17 is chief of staff of the A.E.F. in the United Kingdom, while Harry A. Strain, Ch.E., '15 is a leading factor in the battle of materials in his position as director of raw materials, fuel, and power for the Carnegie-Illinois Steel Corporation.

Newspapers of the United Nations recently carried headlines telling of the new A.E.F. and the announcement that General Bolte was to be chief of staff of the American Expeditionary Forces in the United Kingdom under the command of Major General Chaney.

General Bolte was born in Chicago in 1895 and attended the Oakland School and University High School before entering Armour.

While in college he attended the reserve officers training camps during his summer vacations. After his graduation from Armour he spent a year at the University of Illinois and was subsequently called to service in the regular Army under his reserve commission as second lieutenant.

He went overseas with the Fifty-eighth Infantry of the Fourth Division in May, 1918, and participated in the Aisne-Marne, St. Mihiel and the Meuse-Argonne engagements where he was wounded, recovering in time to enter Germany with the Army of Occupation. He was decorated with the Order of the Purple Heart.

When he returned to the United States in August 1919 he held the rank of captain and was sent to Camp Dodge in Iowa. He had, by this time, decided to make the Army his life work. He apparently inherited his love for the Army from his father, Colonel Anson Lee Bolte.

General Bolte served in Gary, Indiana during the steel strike and was later sent to Washington to assist in compiling his regimental and division history. He was next ordered to Fort Benning, Georgia as a member of the newly opened infantry school. His stay there was short and in 1921 he became aide-de-camp to General John L. Hines. He served five years with General Hines who was commander of the Eighth Corps Area at San Antonio, Texas. Bolte later returned to the infantry school at Fort Benning as instructor in the tactics section. In 1930 he attended the command and staff school at Fort Leavenworth, Kansas.

Early in the 1930's he went to Tientsin, China for three years duty

with the Fifteenth Infantry. Upon his return to the United States in 1936 he was assigned to the Thirteenth Infantry at Fort Devens, Massachusetts. From there he was assigned as a student at the Army War College in Washington, D. C.

Upon his graduation, now with the rank of major, he was appointed as a member of the faculty of the college. He remained there for three years after which he spent several months in the office of the Chief of the Air Corps. He was then ordered to Camp Blanding, Jacksonville, Florida on the staff of Major General Jay Z. Benedict, in charge of plans and training. After assisting in organization of the staff he was sent to London, England. He held the rank of lieutenant colonel and was one of a group of seventeen special observers. In December 1941 he was made colonel and in January 1942 a brigadier general. He has been named chief of staff of the A.E.F. in the United Kingdom under Major General James Chaney according to a recent announcement.

His wife, the former Adelaide Poore, is the daughter of the late General Poore. They have three children, David Endicott, Philip Anson, and Damara. The family is now living at Atlantic Beach, Florida, a suburb of Jacksonville. He is a member of Phi Kappa Sigma fraternity.

HARRY A. STRAIN is not only a Man of the Month but a Man of the Hour in the great rush to produce defense materials. He has the position of director of raw materials, fuel, and power for the Carnegie-Illinois Steel Corporation, with offices at Pittsburgh, Pennsylvania.

Strain was born of Scotch parentage in Clinton, Illinois. He received his early education there, graduating from the Clinton High School in 1904. He excelled in football, baseball, and track and was a leading member of the oratorical society.

Not having enough money to enter college, he decided to work instead. After having worked at several odd jobs he entered the employment of the Illinois Steel Company (now a subsidiary of the Carnegie-Illinois Steel Corporation) in August, 1905 at the Joliet works as a laborer around blast furnaces.

In 1911 he entered Armour Institute of Technology in the chemical engineering department. He continued to earn his expenses by working during his spare time in the steel mills at Joliet and held the position of extra foreman of blast furnaces.

He left Armour in 1915, needing but three credits for his degree in chemical engineering, and was transferred to the South works plant of Carnegie-Illinois in Chicago. Strain was soon sent to the Milwaukee division where he was in charge of blast furnaces. On June 1, 1920 he returned to the South works as second assistant superintendent of blast furnaces.

On January 1, 1921, while the plant was not operating, he was loaned to the Woodward Iron Company and held the position of general superintendent of blast furnaces. Early in 1922 he was requested to return to the South works as first assistant superintendent of blast furnaces. He was promoted to division superintendent of blast furnaces in October 1926, a position he held until when he became general superintendent. Eighteen thousand employees were under his jurisdiction at this time.

Strain won new laurels in the steel industry by his promotion on January 1, 1941 to the position of director of raw materials, fuel, and power. He was then transferred to the head office in Pittsburgh. His new duties included the control, distribution, and procurement of all raw materials, including ores, coal, and limestone, for the Carnegie-Illinois Steel Corporation, National Tube Company, and the American Steel and Wire Company. He was responsible for coordinating these activities in the Pittsburgh, Chicago and Johnstown areas. He also acted as advisor to the vice-president in charge of operations.

Having spent almost his entire professional career in the steel industry, Strain is greatly interested in steel research problems. He conducted important pioneer work in the mineralogy of metallurgical slags in conjunction with Professor McCaffrey of the University of Wisconsin. During the time he was president of the Chicago District Blast Furnace and Coke Association, the association was instrumental in aiding in the development of the 1000-ton blast furnace and auxiliary which was the basis for large furnace development throughout the world.

While reminiscing, he paid a fine tribute to the help given him in his college days by Deans Monin and Raymond, and Professors Penn, Palmer, Wilcox, Freud, Scherger, Leigh and Swineford. His motto has always been "the clearest measure of leadership is its apparent absence."

Strain married Elma Bradley of Joliet shortly after leaving Armour and has two daughters, Dorothy and Jane.

He recently purchased a small home located at 311 Jefferson Drive, Mt. Lebanon, Pennsylvania.

He is a member of the American Foundrymen's Association, the national and local groups of the American Institute of Mining and Metallurgical Engineers, the American Iron and Steel Institute, and the Chicago and Pittsburgh chapters of the Blast Furnace and the Oven Association. He is a member of the Flossmoor Country Club and South Shore Country Club, Chicago.

ALUMNI MEETINGS HELD

The Alumni Association of Illinois Institute of Technology is being enthusiastically supported by alumni in many cities other than Chicago. In several cities alumni have held meetings, renewed old acquaintances, and have learned of the progress of their Alma Mater since their graduation.

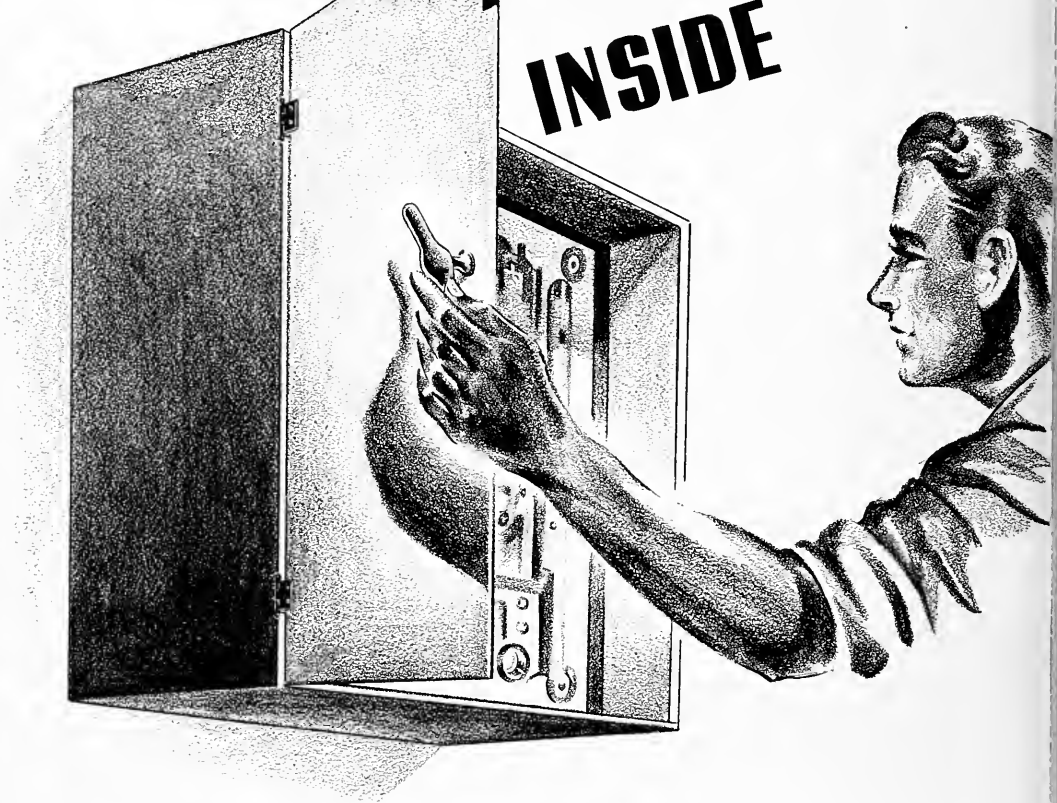
INDIANAPOLIS MEETING

Indianapolis was the scene of its first Illinois Tech alumni meeting on November 10, 1941, at the Washington Hotel. This meeting was sponsored by Elmer W. Hildebrand, Lewis, '17 and E. E. McLaren, F.P.E., '24.

President Heald reviewed the background of the consolidation of Armour and Lewis, reported on the academic work of Illinois Tech, and discussed the development program. Bernard P. Taylor, assistant to the president, spoke of the plans for future alumni organization. J. Warren McCaffrey, Ch.E., '22, told of the work that had been done by an alumni consolidation committee. Among those present at the dinner were:

Abrahamson, Milton J., C.E., '28.
Allaire, Louis P., F.P.E., '27.
Allen, E. W., Ch.E., '34.
Andrews, F. S., F.P.E., '26.
Beal, M. R., F.P.E., '32.
Beatty, Stanley A., F.P.E., '30.
Charlton, J. Donald, Ch.E., '40.
Drum, Robert L., F.P.E., '34.
Eddy, Richard R., F.P.E., '31.
Gamble, John W., F.P.E., '29.
Gryglas, Stephen, M.E., '38.
Heckmiller, I. A., C.E., '32.
Henrikson, Karl E., M.E., '24.
Hildebrand, E. W., Lewis, '17.
Hockert, Chester E., M.E., '37.
Jenkins, Oscar J., C.E., '24.
Jenson, Gust, Jr., Ch.E., '33.
Langhammer, K. C., F.P.E., '31.
Maci, Raymond J., M.E., '35.
Macy, Kent L., F.P.E., '28.
McLaren, E. E., F.P.E., '24.
Montgomery, H. W., F.P.E., '30.
Mullins, Harley W., F.P.E., '30.
Nicholson, H. E., M.E., '23.
Paul, D. J., F.P.E., '30.
Payne, Frederick D., F.P.E., '28.

TAKE A QUICK LOOK INSIDE



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Pierre, Edward D., Arch., '15.
Pihl Stanley E., M.E., '33.
Ransel, J. E., F.P.E., '30.
Smith, P. V., F.P.E., '35.
Walsh, A. S., F.P.E., '27.
Wright, Arthur E., I.I.T., '11.
Zvone, Joseph W., M.E., '33.

ROCKFORD MEETING

An alumni meeting was held in Rockford on December 9, 1941, in the Venetian Room of the Nelson Hotel. The sponsors of this meeting were Paul T. Abramson, Arch., '32 and Jens D. Larsen, Lewis, '34.

The speakers were President Heald and Messrs. Taylor and McCaffrey. The following men were elected officers: Chester E. Wolfley, Arch., '14, president, and Jens D. Larsen, Lewis, '34, secretary.

Among those who attended were:

Ansel, Richard M., E.E., '38.
Appel, Henry L., M.E., '37.
Dalton, Robert F., Ch.E., '35.
Devine, Harry A., Lewis, '25.
Floberg, Delphin W., Arch., '32.
Garen, Donald R., M.E., '30.
Greenman, Hugh M., M.E., '36.
Hanson, Karl M., E.E., '35.
Hulbert, Stennett C., Arch., '18.
Jost, William L., E.E., '32.
Olson, Herbert O., M.E., '18.

MINNEAPOLIS-ST. PAUL MEETING

The Minneapolis-St. Paul alumni meeting took place on December 29, 1941, in the Solarium Room of the Curtis Hotel in Minneapolis. Carl H. Johnson, F.P.E., '29 and George L. Shoppe, Lewis, '17 sponsored the meeting. Speakers from the Institute were Bernard P. Taylor, and Professor J. B. Finnegan, director of the department of fire protection engineering at the Institute.

Carl H. Johnson was elected president and George L. Shoppe was elected vice-president of the group.

Those present at this meeting were:

Baldwin, W. Hale, F.P.E., '25.
Blume, E. A., F.P.E., '29.
Chun, Edwin H., M.E., '32.
Dicke, Leonard H., C.E., '31.
Endert, Kenneth G., C.E., '37.
Erland, E. C., F.P.E., '31.
Finnegan, Stephen P., F.P.E., '39.
Gedelman, Fred G., F.P.E., '29.
Griesman, A. H., F.P.E., '31.
Gunther, Alfred C., F.P.E., '30.
Holmboe, Jens A., C.E., '11.
Larson, Richard A., F.P.E., '41.
Marks, Arthur, Jr., M.E., '41.
Melka, Charles L., E.E., '26.
Millott, A. T., M.E., '27.
Pinkerton, Elwood M., E.E., '09.
Schodde, G. W., F.P.E., '32.
Shaw, Earle H., F.P.E., '34.
Slavin, Frank E., F.P.E., '40.
Streeter, S. E., Arch., '28.

WASHINGTON-BALTIMORE MEETING

The alumni in the Washington-Baltimore area met on January 8, 1942, at the Cosmos Club, Washington, D. C. Sponsors for the meeting were Dudley F. Holtman, C.E. '12, who presided and who was appointed acting chairman of the group and E. G. Nourse, Lewis, '04. Fay M. Findley, Lewis, '36, the only lady present, was appointed acting secretary. President Heald was the principal speaker. Those present at the meeting were:

Anderson, Floyd E., E.E., '40.
Anderson, Willard A., C.E., '28.
Bauermeister, H. O., Ch.E., '37.
Biegalski, Casimir J., Arch., '28.
Bigos, Casimir L., Ch.E., '40.
Bird, Harlan W., M.E., '21.
Chapman, William O., E.E., '21.
Cohen, Jacob L., E.E., '10.
Ellis, Theodore R., Jr., Arch., '27.
Endres, Louis M., E.E., '25.
Epstein, Leon S., M.E., '40.
Erwin, Henry P., Lewis, '02.

Fleig, Donald H., E.E., '36.
Frost, Alexander Jr., M.E., '30.
Frost, George E., E.E., '40.
Hemple, H. W., C.E., '16.
Herdman, Donald E., E.E., '40.
Jaffee, R. J., Ch.E., '39.
Jones, Thomas F., M.E., '35.
Kichaven, Joseph, Arch., '37.
Krantz, Herman F., M.E., '41.
Leep, Joseph, Lewis, '10.
Lozins, Neal G., M.E., '39.
Mandel, Ernest M., Arch., '40.
Newlin, Walter S., Arch., '27.

Parkin, Richard L., Ch.E., '41.
Steck, Leon J., C.E., '30.
Venema, M. P., Ch.E., '32.
Westenberg, J. E., Ch.E., '31.
Wilcox, Sidney W., Lewis, '04.
Woodsmall, Frank J., E.E., '34.
Yap, D. M., Lewis, '30.

PHILADELPHIA MEETING

The Philadelphia meeting was held January 19, 1942, at the Union League Club in that city. Harry L. Strube, M.E. '06 was elected president of the club and Frank J. Wise, Lewis, '14 was elected secretary.

Speakers at the Philadelphia meeting were President Heald and Bernard P. Taylor.

Alumni who attended were:

Bacci, Raymond, Ch.E., '37.
Cole, Ben R., E.E., '41.
Forster, H. Walter, Lewis, '05.
Johnson, Edgar R., F.P.E., '36.
Perry, Herbert J., Ch.E., '18.
Poole, Frederick M., C.E., '24.
Weaver, H. P., Lewis, '05.
Wilcox, Maurice L., M.E., '16.

PITTSBURGH MEETING

The Pittsburgh meeting was held on Friday, January 23, 1942 at Hotel Fort Pitt. Harry P. Richter, C.E. '32, and Grant D. Bradshaw, Lewis, '00, acted as co-chairmen and organized the meeting. President Heald, and Messrs. Grinter and Taylor were the guest speakers.

The following were elected officers of the first Pittsburgh alumni group: President, Harry P. Richter, C.E., '32; vice-president, Grant D. Bradshaw, Lewis, '00; secretary-treasurer; Victor J. Kropf, E.E., '36.

Among those who attended this meeting were:

Bradford, J. D., M.E., '13.
Erland, G. G., M.E., '30.
Geisler, E. Walter, F.P.E., '21.
Hatman, J. G., M.E., '10.
Kuffel, Charles P., F.P.E., '34.
Lindblom, W. V., C.E., '15.
Miller, Nelson T., Lewis, '14.
Nelson, E. F., E.E., '03.
Price, James W., Lewis, '33.
Sloan, James R., E.E., '97.
Strain, Harry A., Ch.E., '15.
Trognitz, W. R., Ch.E., '30.
Watt, R. M., M.E., '17.

1904

Watt, James McCombie, M.E., passed away on August 14, 1940. At the time of his death he was chief engineer of the Works Engineering Department of the Buick Motor Company.

1905

Brackett, John C., E.E., who is a consulting engineer, has recently changed his business address to 1860 Broadway, New York City. He resides at 250 West 91th Street, New York City.

Clark, Frank C., E.E., of Floral Park, New York, passed away on October 28, 1941.

Hein, Peter L., C.E., is employed by the Public Buildings Administration, Washington, D. C., as an engineer advisor. His home address is 3743 Fessenden Street, Washington, D. C.

Hill, Warren E., M.E., is director of the Washburne Trade School in Chicago. His home address is 7100 South Shore Drive, Chicago.

Lennartz, Garfield P., M.E., is employed by the U. S. Air Conditioning Corporation, 220 South State Street, Chicago, and resides at 2741 Fullerton Avenue, Chicago.

1906

Hotchkiss, C. C., Ch.E., is chief gas tester for the Department of Streets and Electricity, City of Chicago. He lives at 3059 North Central Park Avenue, Chicago.

Smith, George W., E.E., passed away on December 6, 1941. He had been in engineering work in and about Dallas, Texas since his graduation from Armour. He was president of his senior class at Armour and was making arrangements for the first meeting of Illinois Tech alumni in Dallas until a short time before his death. He was en route to Huntsville, Alabama, when his death occurred.

1908

Watson, Dudley C., who was a student in the chemical engineering department at Armour, is now artist-lecturer at the Art Institute of Chicago. His home is at Ravinia, Illinois.

1909

Downton, Percival George, E.E., who is a sales engineer for the Electric Storage Battery Company of Chicago lives at 925 Ontario Street, Oak Park, Illinois.

1910

Grenoble, Herbert S., M.E., is director of the Richmond Branch of the Virginia Polytechnic Institute and resides on Cherokee Road, Richmond, Virginia.

Chain

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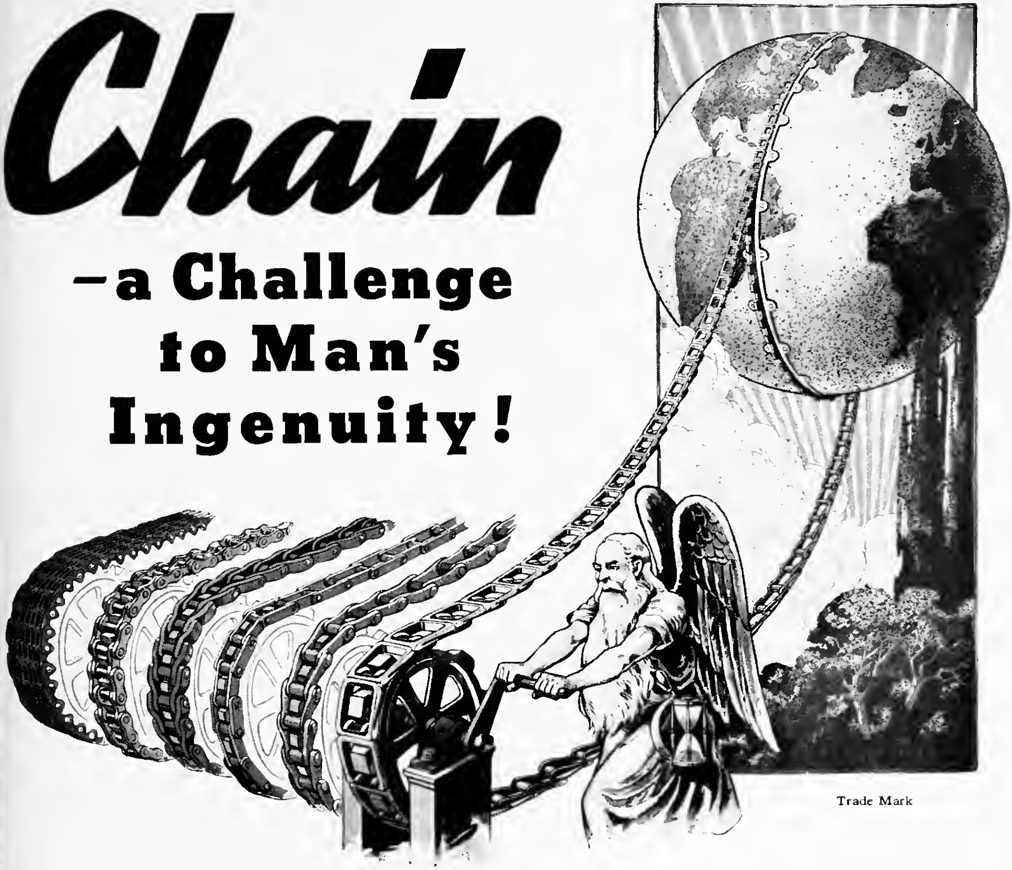

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Years ago, when Link-Belt Company was young, the trade-mark of Father Time turning the earth identified the then struggling organization which was building upon a new and unique idea of the First Successful Power Transmission Chain. And the artist's conception has long since become a reality. Link-Belt Chain literally has moved the world.

• Possibly it could be said that necessity mothered the invention of Ewart Link-Belt, yet it was the genius of William Dana Ewart, founder of Link-Belt Company, and the ingenuity of his fellow pioneers—James Mapes Dodge and others—which established the advantages of chain for transmitting power and moving materials. It was these men who created the necessity for chain in Industry.

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The food we eat, the clothes we wear, our homes, automobiles, highways, all reflect the benefits of Link-Belt engineering skill. Chain plays a vital part in the economical creation and distribution of practically every necessity and luxury which our people enjoy in abundance.

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THE GREATEST NAME IN CHAIN

Martin, Herbert W., Ch.E., passed away on February 1, 1942. Death resulted from a heart attack. At the time of his death he was employed by the Peoples Gas Light and Coke Company, 45 East Pershing Road, Chicago. His home was at 215 Regent Street, Glen Ellyn, Illinois.

Vynne, Eustace, C.E., is Pacific northwest manager for the Philco Radio and Television Corporation of Philadelphia. He lives at 6008 50th Northeast, Seattle, Washington.

1911

McGuire, William P., E.E., who was a member of the engineering staff at the Indiana Inspection Bureau passed away on December 1, 1941. He is survived by his widow, a daughter and two sons.

Nelson, Arthur W., is a consulting engineer and has recently been doing special work in connection with defense contracts. He lives at 11127 South Park Ave., Chicago.

1912

Chandler, John G., C.E., who is in the engineering department of the Kiewit Condon Paschen Company of Parsons, Kansas, is working on the erection of a shell-loading project for the Kansas ordnace plant. He gives his home address as 610 North Humphrey Avenue, Oak Park, Illinois.

Geisler, Rupert Jules, C.E., is a sales engineer with the Yale & Towne Manufacturing Company, 518 Railway Exchange Building, Chicago. His home is at 4801 Drexel Boulevard, Chicago.

Langstaff, Harold A. P., E.E., an electrical engineer employed by the West Penn Power Company, 14 Wood Street, Pittsburgh, Pennsylvania, resides at 625 Ridgefield Avenue, Pittsburgh. He writes that he has one son in the Navy Air Corps and one son in the Military Academy at West Point.

Lewis, George D., C.E., is employed by the War Department, Governors Island, New York, as civil engineer. His home address is 55 West 11th Street, New York City.

Wolfe, Thomas F., C.E., is a research engineer for the Cast Iron Pipe Research Association, 122 South Michigan Avenue, Chicago. He lives at 904 Greenleaf, Wilmette, Illinois.

1913

Badger, Orville Chester, C.E., is an office engineer for the Interstate Engineers & Constructors, Fairmont, West Virginia. He gives his home address as 735 Wisconsin Avenue, Oak Park, Illinois. His Fairmont residence is 3 Park Drive.

Rothwell, Richard Foss, C.E., passed away as a result of a heart attack on November 22, 1941, at his home, 927 South Euclid Avenue, Princeton, Illinois. He is survived by his widow, Mrs. Lorena Rothwell.

1914

Hepp, Emil Jacques, F.P.E., was elected secretary of the Springfield Fire and Marine Group of Insurance Companies early in February. Upon graduation from Armour, Hepp became an inspector with the Underwriters Bureau of the Middle and Southern States and later became sprinklered risk inspector for American Lloyds in New York. After serving in the army he returned to American Lloyds and in 1920 was appointed special agent for the Springfield Companies in Ohio. In 1924 he was called to the Chicago office and served as general inspector until 1931 when he was made superintendent of the brokerage and improved risk departments. In 1929 he was elected assistant secretary. His home is at 2215 East 68th Street, Chicago.

Sexsmith, Harold O., is a major, U. S. Army, Quartermaster Corps.

Wetzel, Clarence Ludwig, E.E., is employed as vocational teacher trainer for the St. Louis Board of Education, 3405 Bell, St. Louis, Missouri. He resides at 5540 Pershing, St. Louis, Missouri.

1915

Cruttenden, Charles N., is an architectural draftsman employed by the Northern Pump Company, Fridley, Minnesota. His home is at 1860 Jefferson Avenue, St. Paul, Minnesota.

Lewis, Jacob, Arch., is in business for himself as an architect at 30 N. Dearborn Street, Chicago, and is living at 6105 Woodlawn Avenue, Chicago.

1916

Bower, Floyd T., F.P.E., who is a label service inspector for Underwriters Laboratories, 207 E. Ohio Street, Chicago, resides at 7757 Lowe Avenue, Chicago.

Enzler, LeRoy Joseph, E.E., is chaplain at the Mercy Hospital, Cedar Rapids, Iowa.

Peterson, Leonard, F.P.E., has been made a vice-president of the Home Insurance Company of New York. His home address is 152 Wyoming Avenue, Maplewood, New Jersey.

Rice, George H., is executor of the estate of George L. Rice after having been active for twenty-five years as a fire protection engineer. He retired in 1939 and his address is Box 696, 1901 Jefferson Street, Hollywood, Florida.

Stephens, Donald R., is employed as a foreman at the Denver ordnance plant for

the Remington Arms Company. He lives at 365 S. York Street, Denver, Colorado.

1917

McGrew, Kenneth A., Arch., is a partner in the firm of Maher and McGrew, 626 Grove Street Building, Evanston, Illinois. He writes that his partner is H. E. Maher, Arch. '17. He lives at 1721 Chancellor Street, Evanston, Illinois.

1918

Davison, F. McKenzie, writes that he has "quit engineering and gone to contracting" with the Arlington Asphalt Company, Rosslyn, Virginia. His home address is 4404 Volta Place, N.W., Washington, D. C.

1919

Behlman, Clifford H., is a marine electrical engineer employed by the California Shipbuilding Corporation, San Pedro, California. His home is at 3729 Wellington Road, Los Angeles, California.

McClung, Ernest E., Ch.E., is a research chemist employed by the Van Straaten Chemical Company, 5520 Northwest Highway, Chicago. He resides at 828 Drexel Square, Chicago.

Trask, Frederic A., F.P.E., is a special agent, doing plant inspection work for the District Security Office, 11th Naval District, Room 200, Broadway Pier, San Diego, California. He gives his residence as 3645 Park Boulevard, San Diego, California.

1920

McCormack, John Thomas, is an instructor in metallurgy at Virginia Polytechnic Institute at Blacksburg, Virginia. He writes he is doing research on the beneficiation of ores of strategic importance in Virginia and adjacent states.

Regensburger, Richard W., M.E., is a superintendent at the Neuhoff Packing Company, 1307 Adams Street, Nashville, Tennessee.

Wynne, Hugh, is a salesman with the U. S. Gypsum Company, 7310 Woodward Avenue, Detroit, Michigan, residence is at 4803 Haverhill Street, Detroit, Michigan.

1923

Colby, Donald C., E.E., who is a sales engineer for The Texas Company, 3052 Archer Avenue, Chicago, lives at 6731 Jeffery Avenue, Chicago.

Rutishauser, Donald E., M.E., is chief engineer of the Hussmann Ligonier Company, St. Louis, Missouri. He resides at 458 Pasadena Avenue, Webster Groves, Missouri.

Sloan, Fred E. Arch., who is an architect at the University of Illinois, 721 S. Wood Street, Chicago, makes his home at Briar Road, Golf, Illinois.

1924

Farrell, J. Stanley, E.E., is employed by the G. & W. Electric Specialty Company, 7780 Dante Avenue, Chicago, as purchasing agent. His home address is 10241 S. Leavitt Street. Chicago.

Olsen, Norman B., who is director of flying at an army flying school, was recently promoted to the rank of lieutenant colonel at the "West Point of the Air." Colonel Olsen reported to his present station from Albrook Field in 1939. He has more than 3500 hours in the air as a flying officer in the U. S. Army Air Force.

1925

Landreth, Morton L., M.E., passed away January 1, 1939. He resided at 418 Hill Avenue, Elmhurst, Illinois.

Latta, Lynn M., F.P.E., is Northern California and Nevada manager for the Travelers Fire Insurance Company, 315 Montgomery Street, San Francisco. He lives at 6201 Rockwell, Oakland, California.

1926

Armit, Edward A., Ch.E., who is an instructor in chemistry at the Amundsen High School, 5110 N. Damen Avenue, Chicago, resides at 538 S. Euclid Avenue, Oak Park, Illinois.

Olsen, '24

1927

Hall, Perry C., E.E., writes that he has recently changed his address to 347 Lafayette Street, Marion, Ohio. He is still with the Universal Cooler Corporation as assistant chief engineer.

Millott, Arthur T., M.E., is president of the Conditioned Air Equipment Company, 2455 University Avenue, St. Paul, Minnesota. His residence is at 224 Oakmont Road, Interlacken, Hopkins Park, Minnesota.

Ross, Harold E., M.E., of 1234 N. Wood Street, Sherman, Texas, writes in part as follows:

Gentlemen:

Some time ago I noticed in the *Engineer* that my business address and status, as evidently appearing in your records, was not up-to-date.

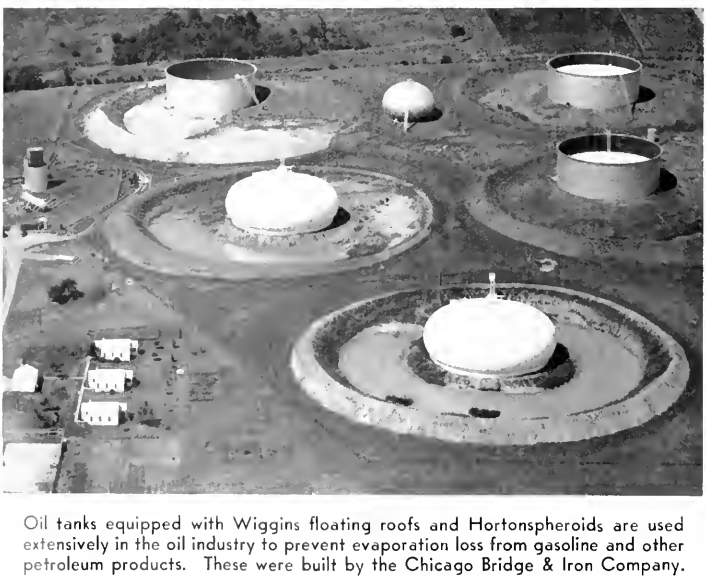
I have intended for some time to write to you and advise you regarding this but due to the stress of my daily program I have put it off from time to time. It came to my mind again tonight while I was again reading through the last copy of the *Engineer* and I thought I had better drop you a line before I put it off again.

For the past two years (since January 1940) I have been associated with the Interstate Cotton Oil Refining Company and Meadolake Foods, Inc., of this town, in the capacity of chief engineer. I am in charge of the refrigeration department, boiler room, fire protection and watch service, and the entire maintenance department.

I have greatly enjoyed receiving the *Engineer*, especially since I have been down in this part of the country. It seems that the *Engineer* improves a good deal with every single issue. Good luck to you and the continued progress and improvement of the *Engineer*.

Sincerely yours,
Harold E. Ross.

Long, Chester, F.P.E., is a special agent for the Southwestern General Agency, 914 T. & T. Building, Phoenix, Arizona. He resides at 1818 Palmcroft Drive, NE., Phoenix, Arizona.



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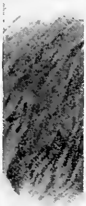
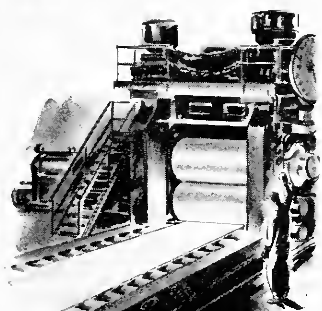
A wingspread of 212 feet ...every inch preened sleek as satin! The perfect smoothness of the metal sheathing on American warbirds like the B-19, world's mightiest bomber, isn't there for looks. It's essential to top performance. How do they get the flawless sheets of metal used to make airplanes? They're rolled out by the ton by giant steel rolls. And keeping the surfaces of these rolls ground to almost perfect accuracy and finish is another of the vital contributions of Carborundum-made wheels to America's defense.



Thousands of other products for defense and for normal needs are made by the rolling process. Plate glass for your car, steel rails, plastics, tin plate and paper are only a few. And since their surfaces can be only as perfect as the faces of the rolls that roll them, finish is highly important. Today, surface quality of rolls can be maintained to within a few millionths of an inch by the use of Carborundum-made grinding wheels.



The same skill and experience that have helped develop modern roll grinding technique will be at your disposal in any industry with which you may become associated. Whatever the use of grinding wheels or coated abrasives, Carborundum engineers are ready at all times to advise and help. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

CAPOUCH, JR., CHARLES, E.E., is a rate-setter for the Western Electric Company, Hawthorne Works, and lives at 2116 Euclid Avenue, Berwyn, Illinois.

1928

HEIMASTER, JOHN WILLIAM, Ch.E., was married to Annabelle Dadisman of Philippi, West Virginia, on July 3, 1941. His home address is 1715 Quarrier Street, Charleston, West Virginia. He is with the Carbide & Carbon Chemicals Corporation, South Charleston, West Virginia.

LARSON, HAROLD E., E.E., writes that he has returned to Chicago after thirteen years in Pittsfield, Massachusetts and Schenectady, New York. He is an application engineer with General Electric Company, 840 S. Canal Street, Chicago, and resides at 7913 Calumet Avenue, Chicago.

1929

BARLEY, LEE E., F.P.E., lives at 520 Downing Street, Denver, Colorado. He writes that he has sold out his interest in an insurance agency in Casper, Wyoming.

FRIEDMAN, THEODORE W., C.E., is on active duty as civil engineer, U. S. Navy.

GORANSON, HARVEY E., F.P.E., is a consultant for the U. S. Navy Department, Navy Building, Washington, D. C. His home address is 1207 Clifton Street N.W., Washington, D. C.

KAYNER, HARRY JULIAN, E.E., is employed by the Doolittle Radio Incorporated, 7421 S. Loomis Boulevard, Chicago, as assistant chief engineer. Together with his wife and daughter, he is residing in their new home at 9216 S. Clifton Park, Evergreen Park, Illinois.

SETTERBERG, WILLIAM NICHOLAS, Arch., has joined the U. S. Engineers office in Galveston, Texas, according to information that has reached the Alumni Office.

SHABINO, CLARKE L., is employed by the Curtiss-Wright Corporation, Buffalo, New York, and lives at 675 Delaware Avenue, Buffalo, New York.

STEENROD, VERNON B., F.P.E., writes he has just opened new offices in Topeka, Kansas with the Insurance Company of North America, having moved from Wichita. His home address is 1831 Medford, Topeka, Kansas.

WILLSON, RUSSELL B., is employed as a junior chemist by the Peoples Gas Light & Coke Company, 3921 S. Wabash Avenue, Chicago.

1930

BALDWIN, DAVID C., F.P.E., is a production engineer with the Royal Liverpool Groups, Room 1111, 175 W. Jackson Boulevard, Chicago. He resides at 6230 Avondale Avenue, Chicago.

BEATTY, STANLEY A., F.P.E., is employed by the Employers Mutual Fire Insurance Company, 732 Fisher Building, Detroit, Michigan.

FILAS, THOMAS J., is a radio musician at the National Broadcasting Company, Merchandise Mart, Chicago. He lives at 1921 S. Central Park Avenue, Chicago

JONES, CHARLES H., F.P.E., in a letter to the associate editor under date of January 10, 1942, from Denver, Colorado, said:

Dear Art:

Just a line to let you know Alan now has a little brother who arrived January 7 about 8:35 P. M. He weighs 7 pounds and 14 ounces and is 21 inches long. Both mother and young son are doing fine, but the hospital staff feared for the father. However, papa can now sit up and take nourishment so the anxiety has been slackened somewhat.

Best regards, Charlie.

NARTEN, NORMAN C., F.P.E., has been made superintendent of the Audit Department of the Fire Insurance Rating Bureau at Milwaukee, Wisconsin. He lives at 3116 N. 47th Street, Milwaukee, Wisconsin.

NEVILLER, BYRON LOUIS, is a teacher of art at Menlo Junior College, Menlo Park, California, and also at the Sequoia High School in Redwood City, California. His home is at 122 Mariposa Street, Palo Alto, California.

VERRELEN, JACK R., Ch.E., is president of the Sterling Laboratories, Incorporated, 1500 N. Ogden Avenue, Chicago.

WELDON, BERNARD J., F.P.E., has become a member of the firm of Dulaney, Johnston & Priest of Wichita, Kansas. He was with the Kansas Inspection Bureau six years before joining the agency four years ago as engineer and producer.

1931

ATTWOOD, FRED B., Ch.E., is superintendent of chemical units, U. S. Cartridge Company, at the St. Louis ordnance plant. He lives at 1616 Lindell Boulevard, St. Louis, Missouri.

EDDY, RICHARD RAY, F.P.E., who has been special agent for the Home Group of Fire Insurance Companies in Indiana, has resigned this position to join the P. K. Morrison & Company local insurance agency at Muncie, Indiana. He will make his home in Muncie.

FICARRATTO, SADO CARL, C.E., is an assistant engineer at the U. S. Engineers Office, Sacramento, California, and resides at 900 O Street, Sacramento, California.

GRIESMAN, ALBERT H., F.P.E., is a special agent for the Great American Insurance Company, 1022 Plymouth Building, Minneapolis, Minnesota. His home address is 2416 Clinton Avenue, So., Minneapolis, Minnesota.

HENSON, LOUIS L., is employed as architectural draftsman for Carl J. Kastrup, 7346 Madison, Forest Park, Illinois. Residence is at 1216 Maple, Berwyn, Illinois.

JENNINGS, JR., GEORGE J., E.E., is now chief petty officer in the United States Navy. He will serve as a physical education instructor under Lieutenant Commander Gene Tunney.

JENS, ARTHUR HENRY, F.P.E., was appointed chief engineer of the Western Department of the Springfield Fire and Marine Group of Insurance Companies and will continue to operate from 222 W. Adams Street, Chicago. Home address is 1638 Juneway Terrace, Chicago.

SPALDING, JR., FRANK W., is employed by U. S. Navy, 803 Northwestern Bank Building, Minneapolis, Minnesota, and is living at 230 Oak Grove Street, Minneapolis.

YOUNG, EVALD A., is assistant manager for the interior decorating studio, Marshall Field & Company, Chicago. He resides at 1412 Chase Avenue, Chicago.

1932

BEALE, FREDERIC, E.E., is engineer for the Idaho Power Company of Boise, Idaho. His home is in Boise, Idaho, Box 2661.

KNOX, EDWIN H., F.P.E., is employed as a special agent and engineer by Crum & Forster, 825 N. Jefferson Street, Milwaukee, Wisconsin, and is living in his new home at 312 E. Willow Road, Milwaukee, Wisconsin.

NEBEL, PAUL L., E.E., is employed by Sears Roebuck & Company, 3301 Arthington Street, Chicago, in the electrical engineering laboratory. His residence is at 1681 N. Lowell Avenue, Chicago.

1933

HELMICK, ALLEN H., Ch.E., is a second lieutenant, U. S. Army, Chicago Chemical Warfare Procurement District. He is the proud father of a daughter, Sara Jane, born September 10, 1941. Residence is at 6233 Blackstone Avenue, Chicago.

JACKSON, WILLIAM D., C.E., was married on June 13, 1941, to Miss Sylvia June Worth, in New York City. Jackson is a junior engineer, U. S. Engineers Office, New York District. His home address is 220 W. 24th Street, New York City.

JENSON, JR., GUST, Ch.E., is a safety engineer with the U. S. Air Corps and gives his home address as 4455 Marcy Lane, Indianapolis, Indiana.

SADEMAN, ELMER E., F.P.E., has been appointed by the Agricultural and Empire State Insurance Companies as special agent for Michigan. For the past two years he has been traveling the Michigan territory as engineer and special agent for National Fire. Residence is at 3327 Wiscasset Road, Dearborn, Michigan.

ZVONE, JOSEPH W., M.E., is employed by the Container Corporation of America, Carthage, Indiana, as a plant engineer and lives at 104 Brown Street, Knightstown, Indiana.

1934

BANTA, DEAN L., Arch., is employed as an architectural designer in Yakima, Washington.

FERRARA, JOSEPH A., M.E., was married on December 6, 1941, in Los Angeles, California. Ferrara is section leader in tool design for the Lockheed Aircraft Corporation, Burbank, California. He lives at 4848 Lexington Avenue, Los Angeles, California.

GILMORE, WILLIAM R., E.E., is employed as a sales engineer for the Allis-Chalmers Manufacturing Company, 135 S. La Salle Street, Chicago, and makes his home at 5243 Argyle Street, Chicago.

Lamberg, John H., E.E., was married on October 18, 1941, to Miss Ingrid Wick of Seattle, Washington. He is division manager for the X-Ray Division of Westinghouse Electric & Manufacturing Company and resides at 1631 W. 16th Avenue, Seattle, Washington.

1935

Armsbury, Richard D., Ch.E., was married on July 10, 1940 to Miss Mary E. Block of Oakland, California, at Las Vegas, Nevada. He is manager of the lubricants department, Atlanta division, Shell Oil Company. He gives his residence as 110 Pinecrest, Decatur, Georgia.

Aschoff, Everett W., is a draftsman employed by the International Harvester Company, Rock Falls, Illinois. His home is at 701 Locust Street, Rock Falls, Illinois.

DeLang, Theodore G., Ch.E., who is a development engineer and compounder with the U. S. Rubber Company, Detroit, Michigan, lives at 518 Chesterfield, Birmingham, Michigan.

Marow, T. Arthur, F.P.E., joined the engineering department of the Fireman's Fund Group of Fire Insurance Companies and will make his headquarters in Chicago. Since graduation from Armour he has been associated with the Rockford office of the Illinois Inspection Bureau.

Schavilje, Joseph P., is employed by the R. S. Bacon Veneer Company, 4702 Augusta Boulevard, Chicago. He resides at 4530 N. Kasson Avenue, Chicago.

1936

Nelson, Vincent Gottfried, Ch.E., is employed as a metallurgist by the Cameron Iron Works, 711 Milby Street, Houston, Texas.

Hughes, Irby M., F.P.E., is employed by the Home Insurance Company of New York, 605 Mercantile Building, Oklahoma City, Oklahoma.

Phillips, Earl, is employed as a pilot by the American Air Lines. He lives at 3247 S. Euclid Avenue, Berwyn, Illinois.

1937

Carlson, Robert R., is employed as a tool designer for the Douglas Aircraft Company, Incorporated, Long Beach, California, and resides at 1730 N. Edgemont, Hollywood, California.

Freeman, Robert, F.P.E., is in command of one of Uncle Sam's largest bombers.

Johnstone, Robert P., Arch., has recently changed his address to 202 N. Central Avenue, Chicago.

McCaulay, John F., F.P.E., in a letter under date of November 18, 1941, from Edgewood Arsenal, Maryland, writes:

Greetings:

Selective service caught me and I'm now in the Chemical Warfare Training Battalion at Edgewood Arsenal, Maryland. Any correspondence from my former classmates, whether in the service or not, will be welcome. Also, if you have a recent copy of the Alumnus on hand, I would appreciate your sending one to me. I was drafted in September and I left no forwarding address.

My address is Edgewood Arsenal, Maryland.

Yours,

Pvt. John F. McCaulay.

1938

Dunbar, C. W., F.P.E., is now employed as a special agent in Wayne County by the Detroit Fire & Marine Insurance Company. His residence is at 544 Harmon Avenue, Birmingham, Michigan.

Henderson, Andrew Benjamin, E.E., is on field duty as inspector of Signal Corps Equipment at Pioneer Gen-E-Motor Corporation, 5841 Dickens Avenue, Chicago. His home is at 2757 Wilson Avenue, Chicago.

Jacobs, Louis John, Ch.E., recently passed the State Board architect's examination and is enlisting as ensign in the Navy.

Krumbein, J. P., Ch.E., has been appointed second lieutenant in the Chemical Warfare Reserves. He was married on July 6, 1941 to the former Ruth Karger.

Kubik, Joseph A., Ch.E., is employed by Stewart-Warner Company, Chicago. He married Miss June Kosta on June 7, 1941, and residence is at 4455 N. Malden Avenue, Chicago.

Laise Jr., William J., E.E., is employed at the Kingsbury ordnance plant, Kingsbury, Indiana, care Tracy Village, House No. 2.

O'Connell, Jr., John Francis, Ch.E., is with the Air Corps.

Widell, Fred M., Ch.E., is employed as an industrial engineer by the Kraft Cheese Company, Chicago and resides at 2652 N. Spaulding Avenue, Chicago.

1939

Anthon, Harold, C.E., is a lieutenant in the Army Air Corps.

Davidkhanian, Ashod Samson, C.E., is employed as computing civil engineer by H. B. Gieb & Company, Dallas, Texas, and has recently been transferred to the Red River ordnance depot. He resides at 2019 Pecan Street, Texarkana, Arkansas, Texas.

Footlik, Irving M., M.E., is general shop supervisor, U. S. Naval Training School, Navy Pier, Chicago. He is also employed as an instructor of descriptive geometry in the Evening Division of Armour College of Engineering. His home is at 3245 Franklin Boulevard, Chicago.

Finnegan, Stephen P., F.P.E., who is an engineer with the Fire Underwriters Inspection Bureau, Plymouth Building, Minneapolis, was married February 14 to Miss Lois E. Copeland, of Minneapolis.

Swanson, Edward R., F.P.E., is an ensign in the Air Corps.

1940

Collins, Walter Scott, M.E., in a letter dated November 15, 1941 advises that he received his commission as second lieutenant in the Army Air Corps on September 20, 1941, and married Miss Betty McGill the same day.

Eulo, Charles Robert, M.E., recently was commissioned as second lieutenant at Chanute Field, Illinois, training field for aviation cadets.

Fahey, James Martin, Ch.E., is now serving as a lieutenant in the Army Air Corps.

Holle, Frederick D., M.E., is employed as mechanical designer for Panama railroad development and may be reached at Box 1291, Diablo Heights, Canal Zone.

Nader Jr., Frank A., E.E., is an electrical engineer (radio branch) War Department, Signal Corps Laboratories, Fort Monmouth, New Jersey. For mail: 5309 Wayne Avenue, Chicago.

Pasiuk, Theodore, Arch., in a letter under date of November 23, 1941, writes in part as follows:

Since my graduation from Armour Institute in June, 1940, I have been receiving regularly two of the Institute's publications, namely the Illinois Tech Engineer and Alumnus and the Technometer. Since March, 1941 I have been in the service of the United States Army, stationed at Camp Livingston, Louisiana.

Shortly after my graduation I was

employed by the Welso Construction Company. When the National Draft Lottery was held in October, I was surprised to find that my draft number, 192, was the second one drawn. It wasn't very long before I found myself a member of Uncle Sam's vast, growing army.

No doubt there are many more (or are there?) Armour graduates of the Class of '40 in the Army. I would only be too glad to extend the great Army pastime—letter writing and exchange views with them about their activities and camp life. I would especially like to hear from the boys of the Architectural Department. Here's for a quick realization of Technology Center.

Sincerely yours,
Theodore Pasiuk.

1941

Yeager, William F., M.E., has completed the Air Corps basic flying school training at Enid, Oklahoma, and was commissioned a second lieutenant. His home is in Evanston, Illinois, and he went to Enid directly from the Air Corps technical school at Chanute Field, Illinois.

Bernstein, Jack, C.E., now resides at 108 S. 14th Street, Herrin, Illinois.

Colant, Ernest J., M.E., has accepted a position as apprentice engineer, training for flight engineer, with the Pan American Airways in Miami, Florida. He has been working there since June 23, 1941, and expects to be in flight work in about one year. He was married on November 27, 1941 to Norma Lehtman of Chicago. They reside at 755 N.W. 18th Place, Miami, Florida.

Hawkins, Karl, C.E., is employed by Tennessee Valley Authority and is an engineer on the Watts Bar Dam.

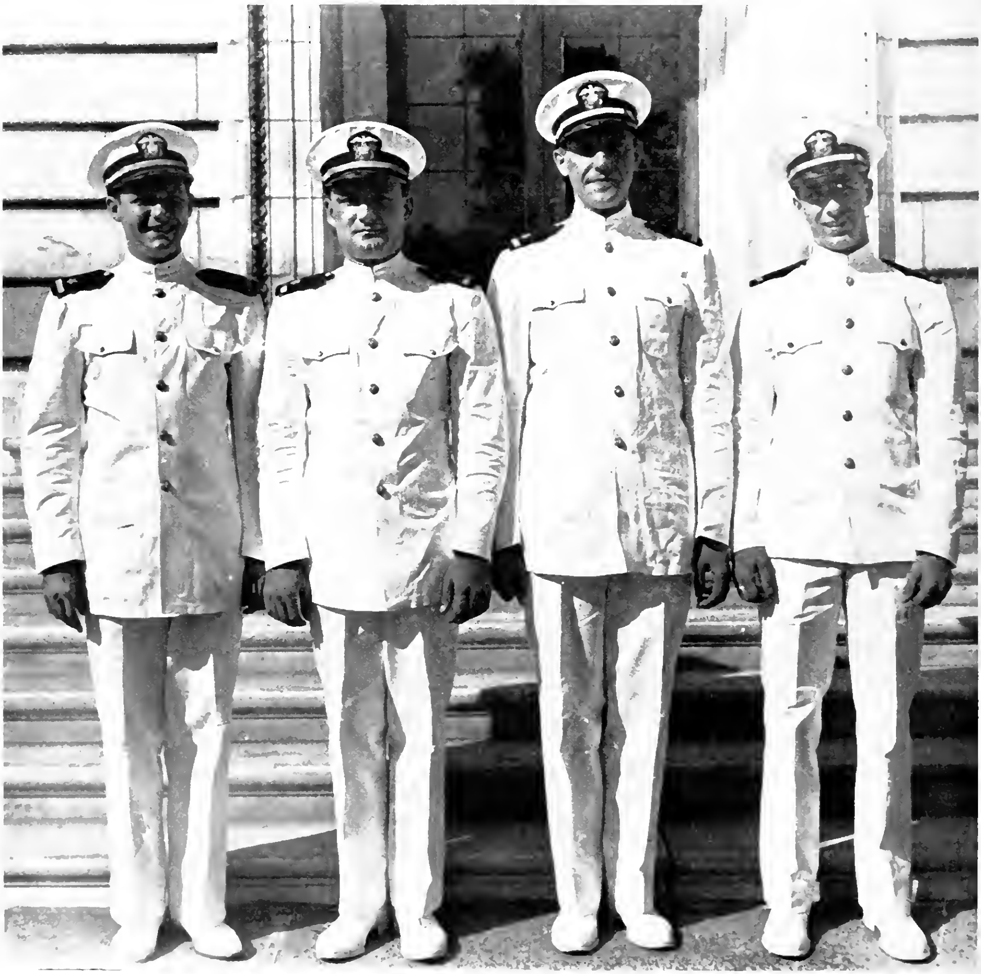
Jacobsen, Roy E., C.E., has been transferred to the Niagara Falls Plant of Kimberly-Clark Corporation. His new home address is 21 Hyde Park Boulevard, Niagara Falls, New York.

Krause, William Frank, M.E., is an ensign with the Naval Ordnance Department.

Lange, Robert Howard, F.P.E., is employed by Missouri Inspection Bureau, Room 1330 Pierce Building, St. Louis, Missouri. He is making his home in the Kappa Alpha house at Washington University in St. Louis.

Larson, Richard A., F.P.E., is an inspector with the Fire Underwriters Inspection Bureau, Plymouth Building, Min-

Recent Armour graduates who have won commissions in the U. S. Navy include these men (from left to right): H. J. Sliwa, Ch. E., '41; C. Bigos, Ch. E., '40; Z. M. Prane, Ch. E., '41; R. L. Parkin, Ch. E., '41.



neapolis, Minnesota. Residence is 3553 Humboldt Avenue, Minneapolis, Minnesota.

MALLEK, ROBERT A., M.E., is an ensign, U.S. Navy.

MOGLE JR., JAMES ADDISON, M.E., was married on September 13, 1941 and resides at 17 S. Seventh Street, Niles, Michigan. He is employed by National-Standard Company, Niles, Michigan. He writes that Edwin R. Langtry, M.E., '41, was married July 2, 1941, and is employed by Reliable Tool & Die Company, Detroit, Michigan.

SEGNER, JOHN, is in the Army Air Corps.

SLIWA, HENRY JOHN, Ch.E., is an ensign with the Naval Ordnance Department.

SWEENEY, ROBERT WALTER, F.P.E., has been commissioned as second lieutenant in the Army Air Corps Reserve.

WILSON JR., WILLIAM, Ch.E., is a graduate assistant at the Missouri School of Mines, Rolla, Missouri. His home address is 3308 N. New England Avenue, Chicago.

MAJKA, EDWARD JOSEPH, Ch.E., is an ensign, U. S. Navy.

BOARINI, EDWARD JOHN, Ch.E., is in the U. S. Navy and is conducting lectures on gas warfare.

AUTOMOBILE DRIVING

(From page 10)

times as great as at 30 M.P.H. It is impossible to put some of these situations into equation form because the equations are not valid when actual breakage occurs.

A point of interest which is little appreciated, although it is urged by motor clubs, relates to the resistance encountered when a car is driven at constant speeds. From the discussions and the computations which have been presented, it is seen that the friction under the tires must provide the propelling force which must equal the resistance encountered. At high speeds wind resistance becomes large and assumes prime importance. Since wind resistance varies as the square of the velocity, the tractive force at 60 M.P.H. is about $2\frac{1}{4}$ times as great as at 40 M.P.H. Since the tires have to exert this force, it is easy to advance the argument that reduced speeds will save tires.

ENAMELING

(From page 12)

to the spray booths. The consistency of cover-coat slips can be controlled by specific-gravity determinations or by viscosity measurements.

DRYING

It is necessary to dry the sprayed coatings under controlled conditions. The temperature is controlled and the

moist air is evacuated by a forced draft.

Brushing

One object of brushing is to prevent chipping at one or more areas of the part; it also has decorative purposes.

For edging or border work, a brush with a guide which rests against the edge to be brushed is used. Brushes of various widths are used to give the desired edge. Sometimes a scribe is used to determine the width to be brushed. The enamel is then brushed off by hand up to this line.

Stencils are made of sheet tin or zinc for irregular brushing and for brushing around perforations. Brushers inspect the ware for broken enamel, spray lumps, and dirt specks. The detection and repairing of these defects at this time rather than after firing saves much time and labor.

Firing Cover Coat

The firing process for the cover coat is the same as that for the ground coat. Over-firing cover-coat enamel results in pin-holes and black-specking which sometimes cannot be covered by another coat of enamel. Under-firing gives a finish with a very poor gloss which has to be refired to bring out the proper luster.

Color Matching and Inspection

Each piece of flatware is inspected for chips, bumps, pin holes, and dirt specks. The inspector has a magnetic thickness gauge which he uses on ware that appears to be too heavily coated.

Color matching is done with photoelectric equipment. This sensitive instrument classifies each piece of ware as to reflectance and the inspector marks the grade with a crayon. Later, in assembly, pieces of like reflectance grades are used in the same appliance.

Reflectance

The reflectance of an enamel finish is defined as the percentage of incident light reflected from the enamel surface. The opacity or "hiding power" of a white enamel is affected by several factors, such as the frit used, the percentage of clay added to the mill, the percentage and kind of opacifier, and the fineness of the milling. Since the development of superopaque frits, the thickness of the enamel coat has been reduced to two-thirds to one-half of the thickness formerly necessary to create equal opacity.

Process Control

The enameling department has a control man on each shift, whose duty it is to check and carry out various processes and record the results of his findings, which are made available to interested persons in the company.

The most important duties of a control man are:

Mill Room

Check fineness of all enamels.
Check set-up of enamels.
Check mill linings.
Check equipment.

Pickle Room

Titrate solutions for concentration.
Check cleanliness of solutions and ware.

Ground-Coat Application

Check water content of slip.
Check cleanliness of equipment.
Check firing temperature and time.

Cover Coat Application

Check set-up and cleanliness of enamel.
Check firing temperature.

SELECTION AND TRAINING

(From page 14)

of a particular type of intelligence test should obviously depend on the general nature of the work. The writer has found, for example, that a simple test of arithmetical reasoning possesses a very much higher degree of predictive significance in technical training than the usual type of intelligence test. Here, obviously, quantitative factors are more important than linguistic.

In this connection, it is important to point out another common difficulty in industrial testing, particularly intelligence testing. The average personnel man or executive wants a quick, snappy measure, although the majority of available intelligence tests cannot be administered in less than an hour. To be sure, a few extremely short tests have been devised, but the personnel man must realize that such tests are usually rough measures, and have very much lower reliability and predictive significance.

In spite of these limitations, it is certainly essential to evaluate intelligence, in order to weed out those who do not measure up to job requirements as well as to discover those who possess ability in excess of job requirements. This latter type of worker soon becomes bored, discontented, and may ultimately quit. A personnel man should not be alarmed at the fact that there is often little or no correlation within an industry between degrees of intelligence and performance on the job. It is essential, however, to determine the *effective* or *critical* range below and above which the worker becomes a poor risk in this respect. This concept has been clearly demonstrated in particular by Dr. Pond of Scoville Manufacturing Company.

Comparatively few clerical tests are available, ranging from such simple forms as the *Minnesota Vocational Test,* in which the time limit for checking names and numbers is only 20 minutes, to the more extensive and specialized *National Clerical Ability Tests,* which take two hours each to administer. The type of tests to be used depends on the general functions to be evaluated as well as the extent to which a coarse or fine "sifting" is necessary, but in facing an immediate and pressing problem of selection, the initial use of tests based on so-called "face validity," without such experimental evidence is justified as a practical matter to meet job requirements. Testing is, after all, a sifting and sorting process.

In the area of mechanical tests, there is a wide variety of the pencil-and-paper type, as well as manipulative and dexterity tests, available. Written tests have been built to

measure the sense of space relations, tool recognition, mechanical forces, and a variety of so-called mechanical aptitudes. Over one hundred trade tests are also available. Dexterity tests range from soundly conceived and well standardized tests of simple operational unities to complicated "gadgets" of questionable value. In this area of testing considerable difficulty is faced in the selection of tests most likely to measure the specific components of the job. For example, hand-eye coordination is not a general quality, but varies widely as fine or gross coordination is necessary. Company-made tests are often necessary to measure such specific job functions. Such tests are limited in variety of validation procedures.

Temperament or personality tests are by far the least satisfactory of any type of test in the pre-employment situation. These tests are usually of the questionnaire type or controlled oral interview, and the honesty of response is usually an unknown factor. Tests calling for specific knowledge or skills are hard to "beat," but the personality test is often an open invitation to answer the questions in such a way and manner as to represent what the testee would consider the most favorable impression. These tests, while highly useful in clinical work, should be used with caution in vestibule testing and still more carefully interpreted, notwithstanding the widespread publicity in respect to some of them.

A wide variety of "special purpose" tests are applicable in certain situations. Some of these tests have a high degree of specificity because they have been developed in and for a particular situation, while experimental use has demonstrated that others have high predictive significance in certain instances. The traditional health examination may in itself be considered a series of tests for certain physiological factors which are vital to success on the job. Conclusions, however, which have often been taken for granted may sometimes be profitably questioned. A case in point: a test consultant called in to aid in the selection of hosiery workers found in one operation a fairly high *negative* correlation between the vision test given and success on the job. This investigator showed that not only was the Snellen Test at 20 feet woefully inadequate for vision demands at 18 inches, but that there was absolutely no correlation between these measurements. He has since developed a special apparatus for measuring short range acuity.

The emphasis which we have just placed on tests which may be used in selection should in no way indicate that testing is limited to the problem of selection alone. Where training programs have been carefully conceived, testing becomes definitely applicable in (1) evaluating the trainee's proficiency at various stages in the program, (2) determining the points of difficulty which are essential to remedial work with the trainee, and (3) providing data for the improvement of special phases of training. In industrial work particularly it is essential that the student be fully trained before taking over a regular job. The opinion of the training department in respect to an individual's abilities is hardly enough unless it is definitely substantiated by well constructed performance tests. As a matter of fact, this same general principle is equally applicable to informal training, as the individual foreman responsible for employees on the job can similarly err. Impartial objective tests are practically a necessity for all training work.

In selecting employed workers for supervisory training programs, tests not only serve as a basis for selection but as a definite morale builder within the organization. Individuals who are made to feel that they will be given the opportunity for promotion or transfer, if they have "what it takes," are far less likely to assume the attitude that "the only way to get ahead is to know somebody." To the employer, test results provide a very tangible tool for dealing with seniority, because seniority is only applicable where abilities are equal. Outstanding ability can often be demonstrated to the satisfaction of unions only by the use of such tests.

Throughout the whole organization of industry the selection of workers, training, up-grading, and promotion, should be contingent upon periodic and scientific evaluation of efforts and skills to effect the maximum utilization of individual effort in a maximally productive way. Business leaders of the future should be as keenly conscious of the specifications of their workers as of their product.

PUNCHED CARDS

(From page 17)

gathering school statistics, in carrying on all types of research projects involving large populations. The punched-card method is also playing an important role in various fields of research in the physical sciences, where machine methods have been applied to involved and extensive calculations and have permitted rapid progress in the advancement of such research.

To summarize: The punched-card method has proven of inestimable value to the research worker in the preparation of statistical data: first, by reason of its flexibility, which makes it possible to use the original unit record to obtain every type of summary and analysis which may be required at any step of the procedure; second, by reason of the speed with which all such statistical analyses may be carried out, making it possible to extend both the original data used and the number of analyses; third, by reason of the definite check and control of the accuracy of all operations which may be maintained at all steps in the procedures. The research worker who employs this method thus is able to make the most productive use of his experience and skill.

A WOMAN

(From page 18)

Mission was to be and do. Her vision included much more than a Sunday school, meeting once a week. With the needs of the children of the neighborhood in mind, she foresaw classes in industrial training for both boys and girls, classes in music, wood carving, and clay modeling, and a kindergarten.

At the beginning Mrs. Beveridge was the organist in the Sunday School, and a member of the council which guided the affairs of the Mission. She soon organized classes in domestic arts for the girls and in mechanic arts for the boys. She was a woman of broad culture and great versatility. In many of the classes she herself was the teacher, and she took an intense personal interest in the entire program. By providing practical training for the children who came to the school, she hoped to make them useful citizens and good Americans. This indeed was fuel for the melting pot.

Thus Armour Mission was established, due very largely to the vision and zeal of Mrs. Beveridge. A library was established in the school and she became librarian, in addition to all her other duties. But willing helpers were always at hand, for the pupils in the school were eager to assist wherever they could. Conspicuous among these voluntary aids was a little fat boy who had an uncanny faculty of being always at hand when Mrs. Beveridge or any other teacher needed help. He would run errands, pump the organ, gather up books in the library, and make himself useful in every way possible. That was a half century ago, but today he is still with us. Staff members in Illinois Institute of Technology will find his autograph on their next pay checks.

The industrial classes which Julia Beveridge founded in Armour Mission soon grew beyond the capacity of the building and the teaching staff. The founding of Armour Institute, six years after the opening of Armour Mission, was a direct result from the experience gained in the mission. It was apparent that a definite need existed for an industrial school where young people could receive a more complete education than was possible in Armour Mission. The million-dollar sermon preached by Dr. Gunsaulus in Plymouth Church, is generally credited as the influence which persuaded Mr. Philip Armour to found Armour Institute. But Mrs. Beveridge too was an important factor, because of the experience which she had had in the mission.

Armour Institute was founded in 1892, and opened its doors to the first students in September, 1893. Mrs. Beveridge was the registrar of the new institution, serving in that capacity for six years. Next she became librarian, a position which she held for twenty years, until her death in 1919. Thus since 1883, when she joined Plymouth Church, she gave thirty-six years to the service of an ideal, helping young people to help themselves. At the time of her death Dr. Gunsaulus wrote, "We never know who the real founders of our best institutions are, until we get back into the quiet region of the supreme forces, and it is oftentimes a woman's hand which guides not only the cradles of the world, but guides the destinies of those who are come out of the cradle."

Old grads of Armour Institute of Technology remember Julia Beveridge best as librarian. In the brief period between classes, when many students were passing to and from the library, she was always to be seen standing by the circulation desk, a trim, tailored figure, erect, a trifle severe perhaps, a silent but eloquent admonition to correct behavior. She had great personal dignity, a certain presence which quelled the boisterous and commanded respect from all. Naturally discipline was no problem for her.

It is difficult to epitomize in a phrase the life and work of a woman like Julia Beveridge. Perhaps the words of Browning are as adequate as any:

> The common problem, yours, mine, everyone's,
> Is not to fancy what is fair in life, provided it could be,
> But finding first what may be, then seek how to make it fair.

Thus Julia Beveridge helped many a young person to a fuller and more useful life, and showed him, within the limits of his capacity, how to make it fair.

The foregoing comment on the early days of the Institute, and about its first librarian, was a part of the program at a recent meeting of the Faculty Woman's Club.—Editor.

MOUSE TRAPS

(From page 20)

then re-immersed for a longer period. The second drying is done by infra-red, and is followed by passage through a glass-enclosed rain chamber. The third drying is done by air. The whole cycle is repeated automatically every eighty-seven minutes, night and day.

A small iron machine-part hung in this apparatus will rust beyond recognition within a week. Much more important is the fact that experimental data thus obtained check closely with actual field observations of such weathering effects.

BOOK SHELF

(From page 30)

brought to bear on the task. The compromise between an all-inclusive multi-volumed work and an inadequate small volume containing only data seems to have been well made in the 3029 pages. While any of us might feel that additional subjects should have been included, we must temper this feeling with the thought that there is a limit to the size of even such a work as this.

ROBERT C. KINTNER.

SCHOOLMASTER

(From page 32)

gineers, young and old, who are "contemptuously ignorant" of literature and the fine arts. Their ignorance is not because they are engineers; it assuredly does not add to their professional competence.

In these days of war, and of feverish production of the tools of war, we hear little of the old slighting reference to professional training as "vocational." For three minutes, let's try to forget the war. Is there not a musical vocation? Has not the successful writer, painter, or sculptor undergone long vocational training? I do not digress here to discuss genius, except to recall that genius implies taking infinite pains, and that it is no derogation to a Shakespeare or a Giotto to speak of his vocation and of his training therefor. Professional training of any kind, artistic training of any kind, is vocational if its interest is to equip a man for the principal activities of his life. The fact that these activities provide his livelihood does not discredit them nor does it affect the worthiness of the preparation for them.

We are impatient with the scientist and the engineer who are smugly unaware of the great fields of culture outside their own immediate occupations. We professional people can properly also be impatient with the smug complacence of the literary man or artist who knows Milton or Raphael but condemns us as Philistines because we are interested in Newton and Faraday

Let's not base our argument for the professional man on the obvious fact that we cannot imagine our world without his techniques. Let's not try now to determine the responsibilities, whether of our philosophers or our industrialists, our economists or our statesman, for the tragic mess that we are in. Let's not consider the bearing of religion, or of irreligion. The schoolmaster, this schoolmaster, is now concerned with mundane things, with education for life here and now, and in the foreseeable future in this world. I do not argue that each of us should be adept in all fields. I do contend that each of us should have appreciation of those cultures in which he is not deeply learned. It is commendable in a physicist that he is a fine violinist, in an engineer that he paints creditable pictures, in a business man that he has composed good music. So also is it commendable, and evidence of breadth of culture, when a musician gives detailed study to the technique of the radio, or when a painter or a dramatist, as an avocation if you will, informs himself of the properties of the photon or about the physics, as well as the esthetics, of sound. So far as our abilities and the limitations of time and energy permit, let us be *whole* men.

CLASSIFIED ADVERTISEMENTS

DID YOU KNOW

Arrows Guide Planes: Newest "light aids" to safe flying are two 83-foot illuminated traffic directing arrows, part of a system of 500 lights built by Westinghouse for the new Washington National Airport. Arrows guide incoming planes to runways when the field is clear.

* * *

Radio Directs Traffic: More than a million bus and trolley passengers are speeded along the streets of New York City every day with the help of radio, yet none of them ever hears the broadcasts. To aid in re-routing buses and trolleys around traffic snarls, the Brooklyn and Queens Division of the New York Traffic System has equipped a fleet of 20 patrol cars with two-way Westinghouse police radios. This communication system relays emergency calls and instructions to cruising cars in less than 30 seconds.

* * *

Poor Sight Plagues Us: Of all children of school age, 25% don't see well. Of the college graduates, 40% need seeing aides. Over 50% of office workers, more than 75% of garment and similar workers have defective vision. And at the age of 60, the time when theoretically we should enjoy a decade or two of pleasant living, more than 90% need seeing "crutches."

* * *

High Altitude Lightning: Another popular belief about lightning has been shattered by research engineers. Contrary to general opinion, lightning strokes are more severe at low altitudes than in high mountainous regions, according to an A.I.E.E. report by L. M. Robertson of the Public Service Company of Colorado, W. W. Lewis of the General Electric Company's Central Station Engineering Department, and C. M. Foust of that company's General Engineering Laboratory. The report concludes a five-year study of lightning and corona currents on the Colorado Public Service Company's Shoshone-Denver 100-kv transmission line, which runs through the heart of the Rocky Mountains.

Constructed in 1908 and 1909 on steel towers, the line is not equipped with overhead ground wires, but rather a single continuous counterpoise wire which is buried in the ground at an approximate depth of one foot wherever possible. Over the high passes at Argentine (altitude 13,500 feet) and Hagerman (altitude 12,000 feet) a double counterpoise has been installed. Starting at the Shoshone Plant at an altitude of 6000 feet, the line passes over the Continental Divide three times and terminates at Denver at an altitude of 5280 feet—the average altitude being 10,000 feet.

Based on some indications that currents in lightning strokes might be smaller and less destructive at high altitudes than at lower altitudes, measurements were started in 1937 by installing surge crest ammeter links on some of the towers. With the installation of brackets on certain towers where past experience indicated that most lightning activity had occurred, and on the counterpoise for most of its length, the general investigation was underway by 1938. Then in addition, in 1940, data on corona discharge levels and polarities over a wide range of elevations was obtained by the installation of corona and surge voltage recording units at three points: on top of Argentine Pass at 13,500 feet; a few miles west of Denver at a medium elevation of about one mile; and at a much lower elevation on a line in Eastern Pennsylvania.

As a result of this concentrated study, several new conceptions have been established. At 18,000 feet, the report shows, there may be an absence of lightning strokes altogether. The probable lightning stroke current decreases with the increase of altitude from sea level to 18,000 feet, at which point the current would reach zero. This is due in part to the fact that the breakdown strength of air decreases about 3 per cent per 1000 feet, so that at 6000 to 13,500 feet its strength varies between 60 and 80 per cent of that at sea level. With less voltage available between cloud and earth, lightning current values are usually lower. Projection of mountains into the cloud regions limits the accumulation of charges by increasing cloud-to-ground leakage, at the same time precipitating discharges before a cloud charge can be built up to average low-altitude lightning proportions.

The investigation has further disclosed that the highest mean temperatures at 18,000 feet do not exceed 32 F. The mean temperature taken at an altitude of 13,500 feet conforms very closely with temperatures at corresponding altitudes in free air as obtained by trial balloons. This coincides with the theory that freezing temperatures may limit the formation of lightning. Contour of the ground, say the authors, and its relation to the direction in which the storm is traveling appear to have more bearing on the location of lightning strokes than geological formations.

RADIO INSPECTOR POSITIONS OPEN IN GOVERNMENT SERVICE

The position of radio inspector in the Federal Communications Commission has been added to those jobs in the field of radio for which the U. S. Civil Service Commission is seeking qualified persons. Salaries range from $2,000 to $2,600 a year. The maximum age is 45 years. Applications for the written test on radio and electrical engineering must be filed with the Commission's Washington, D. C., office not later than April 21, 1942.

For assistant positions ($2,000 a year), completion of a 4-year college course in electrical or communication engineering or physics is prescribed. Provision is made for the substitution of radio engineering experience for this requirement. To qualify for the $2,600 positions, applicants must have had in addition at least 1 year of appropriate radio engineering or teaching experience, or 1 year of graduate study in communication engineering. All applicants must be able to transmit and receive messages in the International Morse Code.

Applications will be accepted from senior students in electrical or communication engineering or physics, or from graduate students in communication engineering, if their courses will be completed by October 1, 1942.

The duties of these positions involve radio inspection work of all kinds, including inspecting radio equipment on ships, air-craft, and at various land stations to determine compliance with Government specifications. The announcements of this opportunity for Government employment and the forms for applying may be obtained at first- and second-class post offices or from the U. S. Civil Service Commission, Washington, D. C.


Chesterfield salutes with Millions of Fans
THE GOLDEN JUBILEE
of America's most popular sport
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It's Chesterfield
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Over 90,000,000 is Basketball's yearly attendance...tops for any American sport...and this year marks the celebration of its Golden Jubilee. The game was founded by Dr. James Naismith and had its modest start in 1891 in Springfield, Mass.
Such popularity must be deserved
That's what millions of Chesterfield smokers get every time they light up...and that's why these millions are saying Chesterfield gives me more pleasure than any other cigarette I ever smoked.
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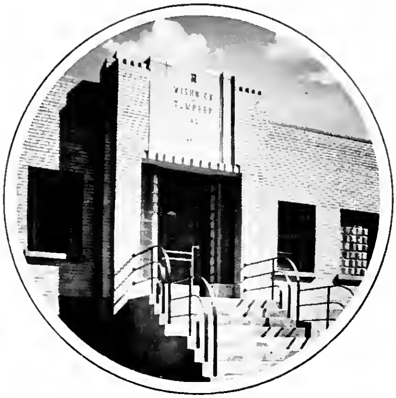
Every time... They Satisfy

ILLINOIS TECH ENGINEER
AND ALUMNUS

MAY, 1942



These 3 New Witco Developments

ARE RELIEVING RAW MATERIAL SHORTAGES IN MANY PLANTS

PERHAPS WE CAN HELP YOU TOO!

Witco Yellow, a replacement for French Ochre; Witco Blancal, an alternate for Blanc Fixe; Witcarb, an improved calcium carbonate—these three new products of Wishnick-Tumpeer research are not only relieving current raw material shortages in many applications, but are finding a permanent place in manufacturing techniques. For these products are not merely "substitutes" born of an emergency; they are definitely superior in many respects to the materials they replace.

These three developments offer convincing demonstrations of the skill and resourcefulness of Wishnick-Tumpeer's staff in dealing with raw material problems. The Research Laboratories of Wishnick-Tumpeer are thoroughly equipped to undertake such problems, particularly in the fields of chemicals, oil, pigments, asphalts, and allied products.

If you are faced with a shortage of raw materials essential to your production—or if new manufacturing conditions require modification in the properties of other materials—perhaps you, too, can benefit by Wishnick-Tumpeer's technical cooperation. Write, wire, or phone us an outline of your problem—what materials you need, what properties they must have, how they are to be used. Let our experienced research workers assist you in the effort to develop alternate or improved materials that may provide a satisfactory solution to your problem.

WITCO YELLOW

A new synthetic pigment, Witco Yellow offers interesting possibilities for replacing French Ochres in rubber and paint manufacture. While practically the same in analysis as French Ochre, it provides these outstanding advantages:

- Greater strength
- Higher tinctorial value
- Cleaner final tint

WITCO BLANCAL

This precipitated barium-calcium compound is available in both low and high oil grades as an alternate to Blanc Fixe. In most cases, it gives better results than Blanc Fixe, since it offers you these desirable characteristics:

- Extremely fine division
- Excellent color, in dry state as well as under oil
- Higher bulking value

WITCARB

This new inert offers special advantages as a white reinforcing filler in rubber formulas requiring high tensile and modulus. In paint formulas, it provides such features as:

- Lower cost per pigment pound
- More gallons per pound
- Added texture in flats
- Better stability in finished product
- Improvements in Lithopone and Titanated Lithopone paints, and in some cases gloss paints and enamels

Samples and complete information on any of these new products will be sent on request.

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G-E Campus News

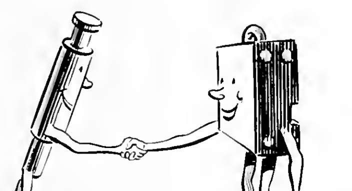
AU-TUBE-IOGRAPHY

GENERAL ELECTRIC'S Radio and Television Department, in its new Radio News Program with Frazier Hunt, is telling the story of electronics to a nation at war—a war in which electronics itself is one of our most powerful tools.

For electronics—the youthful science that embraces all the varied applications of electron tubes—is going into war not only on the front, but behind the front, where it is today revolutionizing many industrial practices.

Unique about this thrice-weekly broadcast (Tuesday, Thursday, and Saturday) is the fact that G.E. is using an electronic device, radio, to carry the story of electronics to America.

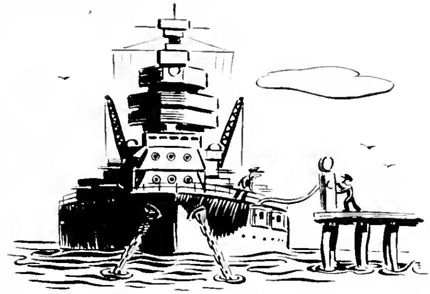
In addition to 51 stations of the Columbia Broadcasting System, G.E. is using the first network of FM stations ever to carry a regular series of broadcasts.



"PLEASED TO MEET YOU"

IT USED to take General Electric 18 months to build one of the great 275-ton machines that cut low-speed gears for cargo-ship propulsion sets. Today that time has been halved by farming out the construction of parts to dozens of subcontractors.

Major parts of the machines come together for assembly from 12 separate subcontractors in five states; miscellaneous smaller parts come from 38 firms in seven states. Jobs of casting, annealing, and machining involve, besides foundries and steel companies, a Navy yard, shipbuilding yards, a locomotive company, and a maker of steel safes. Co-ordinating and checking all these widespread activities is a major achievement in itself, since the finished machine has to be precise enough to cut gears with an accuracy of 3/10,000 inch.



"FILL HER UP!"

BECAUSE the ocean isn't equipped with filling stations every few miles, naval vessels must carry enough fuel for long voyages. And because finding storage room aboard for this fuel is a serious design problem, anything which cuts down fuel consumption is a great advantage.

Most naval ships today are driven by steam turbines connected to the propeller shafts, through reduction gears. And turbine engineers, working with the Navy, have pioneered in the use of higher steam pressures and temperatures—producing turbines of such improved efficiency that in modern ships the fuel consumption per horsepower is from 25 to 40 per cent lower than in vessels of the same type used during the first World War. Thus it has been possible to design ships with greater cruising radius for the same amount of fuel oil, or with more armor and guns for the same over-all weight of the ship.

GENERAL ELECTRIC

952-39-211

Contributors

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Dr. Herman N. Bundesen is Commissioner of Health and President of the Board of Health of Chicago, and Chief of Emergency Medical Services of the Chicago Metropolitan Civilian Defense Area. He has been Coroner of Cook County and has an international reputation for his work in medicine and public health. Dr. Bundesen has written many books and scientific articles, and has been the recipient of many honors. Among these, one of the most notable was his election to the presidency of the American Public Health Association.

Clark Crawford is a research assistant in the Armour Research Foundation.

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IN THIS ISSUE

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THE DEVELOPMENT PROGRAM

Encouraged by reports from Illinois Tech's Special Development Program, which show $1,114,753 already subscribed by a relatively small number of contributors, hundreds of alumni are now enlisting in the next phase of financing for the $3,100,000 building program. This phase is to include a direct appeal to industry generally throughout the Chicago metropolitan area, which got under way on April 16, and the establishment of an Alumni Fund, through contributions from graduates and former students all over the world, to be undertaken about the middle of May.

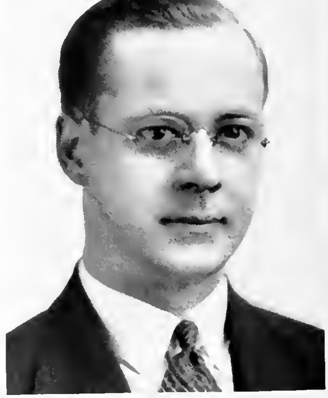
A special organization, composed in the main of alumni, is handling both appeals under the chairmanship of Bernard L. McNulty, president of the Marblehead Lime Company. Associated with him as vice-chairman are Adolph H. Fensholt, Lewis '13, president of the Fensholt Company, Roy M. Henderson, Armour '02, vice-president, United Engineers and Construction Company, and Harold W. Munday, Armour '23, prominent Chicago consulting engineer. Mr. Fensholt has assumed charge of the Alumni Fund program, and he will be assisted by J. Warren McCaffrey, Armour '22, Mr. Munday, and Sidney B. Westby, Lewis '33, in the formation of an Alumni Council.

The Alumni Fund program for the Institute, it is explained by Bernard P. Taylor, assistant to the president, is conceived to provide a plan for annual alumni giving similar to that now obtaining at several hundred of America's leading colleges and universities. At its inception, however, the alumni will consider three definite objectives directly related to the Institute's development program. These, as outlined at a meeting of the Acting Board of Directors of the Alumni As-

(Turn to page 48)

B. L. McNULTY

A. H. FENSHOLT



R. M. HENDERSON

H. W. MUNDAY

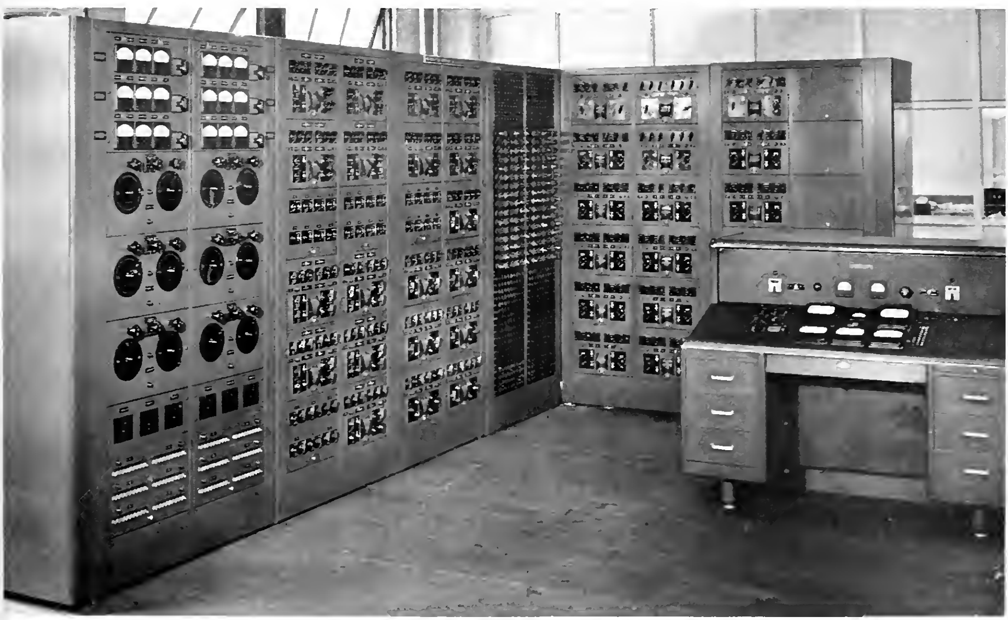
RESEARCH EQUIPMENT IN THE DEPARTMENT OF ELECTRICAL ENGINEERING

By

JESSE E. HOBSON
LeROY T. ANDERSON

The development of the applications of electrical principles has been governed, to a marked degree, by the instruments and equipment the scientists have had at their disposal. There are cases, almost without number, where new principles have been discovered but further development or application has been delayed—sometimes for decades—until such time as new technique or equipment became available. The application of alternating current to the field of electrical power began with the invention of the transformer. Benjamin Franklin applied his kite as a probe to charged clouds and discovered that lightning was electrical in nature, but additional knowledge concerning lightning phenomena did not come until better test equipment was available. In the field

Fig. 1. An a-c network calculator.



of communication, long-distance telephony and radio were successful only after the vacuum-tube amplifier was developed, while satisfactory vacuum tubes could be built only after high-vacuum technique had been improved.

It is the function of a modern laboratory to provide, insofar as is feasible, equipment needed to carry on development work and research. A laboratory in an educational institution must, in addition, serve to illustrate and verify scientific principles for students. Equipment which has been recently added to the Electrical Engineering Laboratories of the Institute will greatly increase the opportunity for study and research in power-systems engineering, illumination, electronics, and communication engineering.

Power Systems Engineering Laboratories

A-C Network Calculator.

Arrangements have been recently completed for the installation of an a-c network calculator at the Institute. It is expected that the calculator will be installed and in operation by November, 1942. The installation was made possible by the co-operation of a number of public utilities and industrial organizations in the Middle West. Each participating organization has contracted for time on the network calculator or "calculating board" as it is more usually called. Engineers of each of the participating companies will spend from one to four weeks per year at the Institute studying their problems of transmission and distribution on the board.

The a-c network calculator consists of a number of adjustable resistors, reactors and capacitors, representing the corresponding constants of the actual system so arranged that the actual power-system network can be reproduced in miniature. Sources of electro-motive force whose magnitude and phase position can be varied at will represent generators, synchronous condensers, and motor load on the systems. Distribution of voltage, current, kilowatts, and reactive power, as well as the phase position of any quantity on the actual system is determined accurately by measuring the same quantities in the miniature system and applying proper multiplying factors determined by the scale to which the network has been set. An entire power system can be set in miniature on the calculating board and operated on the board just as the actual power system is operated in service. The exact effect of any change on the power system can be observed quickly, easily, and accurately.

The board being installed at the Institute cost approximately $80,000 and consists of the following elements:

- 12 Generator elements, each having a variable voltage and phase-angle control.
- 100 Line units consisting of adjustable resistor and reactor elements.
- 40 Load units consisting of adjustable resistor and reactor elements and also equipped with load adjusters to permit ready change in load without change in power factor of the load.
- 32 Capacitor units to represent line charging kva, static capacitors, and synchronous condensers under steady load conditions.
- 18 Auto transformer units to represent transformer taps.
- 6 Mutual transformers for coupling between networks.

A metering desk equipped with the proper instruments for measuring voltage, current, kilowatts, reactive kva and the phase-angle position of any quantity at any point in the network.

Additional equipment associated with the calculating board includes a computing machine, a small d-c calculating board for obtaining system equivalents, and a black and white

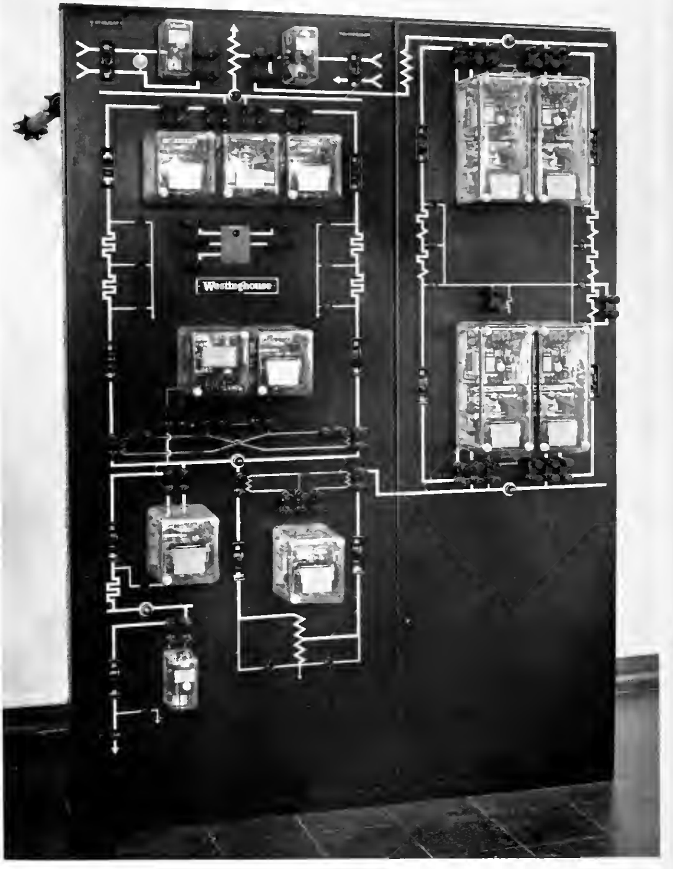


Fig. 2. Relay demonstration panel board.

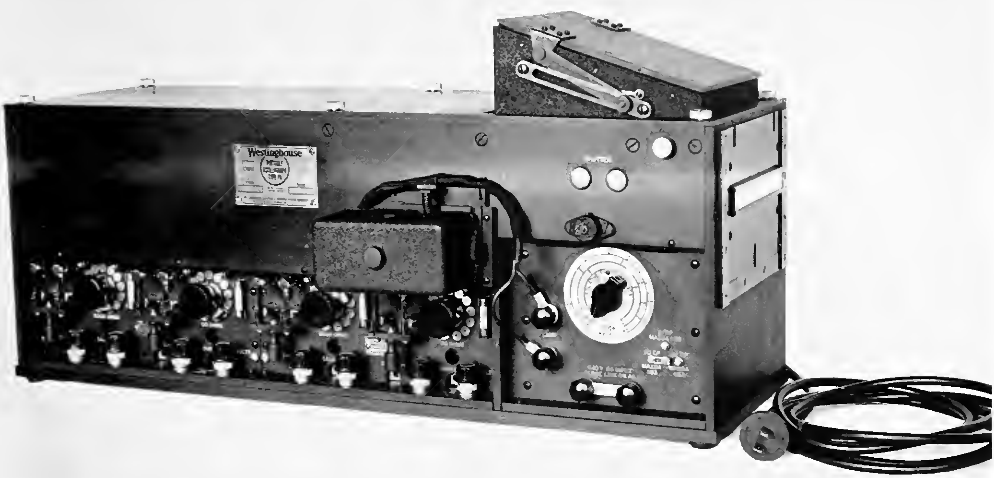


Fig. 3. A seven-element portable oscillograph.

print machine. A photograph of an a-c network calculator similar to that which will be installed at the Institute as shown in Fig. 1. This figure illustrates a board roughly half the size of the Institute board. There will be 14 such network calculators in service in this country by the end of 1942, three of them at educational institutions.

The range of problems studied on the calculating board is very extensive. Such studies include the determination of the location and effect of new generators on power systems; the most suitable voltage for new lines; the effect of new loads, synchronous condensers and static capacitors for improvement of voltage regulation; voltage regulation and load control, etc. Under both steady state and transient conditions the calculator shows quickly the power limits of lines and systems, and follows out the power system reaction to such improvements as quick-response excitation, high-speed fault clearing, changes in circuit layout, and the high-speed reclosing of breakers.

In general, about one analysis in every three will involve system stability. The steady-state stability limit of a system is easily determined with the aid of the calculator, since the operator need only set up the equivalent network and advance the phase angle of the sending generator until the maximum power output is reached. In solving transient stability problems, a step-by-step method must be employed. In such calculations the board reduces the labor tremendously, since system conditions corresponding to each step may be obtained from measurement instead of by tedious mathematical computations. Unbalanced conditions arising from unsymmetrical faults or loading, etc., are quickly determined by setting up the sequence component networks on the board, and applying the general theory of symmetrical components.

A member of the staff in Electrical Engineering will operate the board for the power-company engineers and will work closely with them in the analysis of their problems. Opportunity will be given for graduate students in power-systems engineering to observe studies being made on the calculating board by the utility and industrial engineers and to serve as assistants to the board operator. Knowledge gained from observing such studies will give an insight into actual problems of power-system operations and power-system design that could not be gained in any other manner. The calculating board will also be available for research investigations involving power-system problems to be made by graduate students and members of the staff.

The a-c network calculator is by no means a substitute for brains, but it does eliminate a great many tedious calculations. Good engineering judgment, skill and intelligence are essential in its operation and in the interpretation of its solutions. The calculator has become an indispensable tool in system planning.

Relay Demonstration Panel Board

The necessity for continuity of operation, and the complexity of the modern power system have led to the development of automatic protection and operation of the various units composing it. This protection is built almost entirely around the automatic relay in its numerous forms, and a knowledge of the functioning of modern relay systems is necessary to any electrical engineer concerned with power system operation.

To demonstrate the various steps of relay operation and adjustment, the relay demonstration panel board shown in Fig. 2 has been installed in

Fig. 4. Experimental unit in the communication laboratory.

the power-systems engineering laboratory. This board contains a miniature power-system and all of the relays are connected with the miniature system on the panel board in such a way that their operation can be observed when faults are applied to the miniature system. Short-circuit currents can be calculated for various fault locations, the relay settings can be determined and the relays adjusted, then the fault can be applied and the operation observed. Cycle counters are provided so that exact relay-time can be determined, as well as the proper sequential operation of two or more relays.

The panel board is equipped with the following relays: CO, inverse time overcurrent; CA, transformer differential; CD, current differential; CR, duo-directional overcurrent relay; SC, instantaneous overcurrent relay; and HCZ, high-speed impedance.

The relay demonstration panel board is particularly useful in illustrating the proper relaying of a power system, and predicting the performance of complicated relay arrangements.

Main Electrical Machinery Laboratory

This laboratory has undergone considerable change within the past year. Additional motors and generators have been installed and new benches built. New equipment being developed includes a new-type torque indicator for direct-coupled motor-generator sets, and a wide-range load rheostat. Prof. Moreton has designed and directed the construction of these devices. The torque indicator is a part of the coupling and is so constructed that the torque is observed on a scale fastened to the coupling. By viewing the scale with the aid of a stroboscope the torque value may be obtained.

New equipment in this laboratory also includes a seven-element, portable

oscillograph, shown in Fig. 3. This oscillograph may be used for the visual observation of seven or more quantities, including voltage, current, and power. It may also be used for recording these quantities on film or sensitized paper and produces clear, accurate images up to a frequency of 5,000 cycles per second.

The proper control of motors or other electrical apparatus is as important as the operation of the machines themselves. In fact, the electrification of many automatic machines and processes has depended on the control rather than the drive. Thus, the study of industrial control and control devices is an important phase of power engineering.

Opportunity for the study and manipulation of industrial control-equipment is offered at the Institute. The main laboratory is being equipped with various control devices as well as with the motors and generators necessary to illustrate control methods. This equipment includes d-c and a-c contactors, dashpots, temperature relays, push-button stations, plugging swiches, vacuum-tube timers, and photo-electric relays. Magnetic controllers for starting, reversing, braking, and speed control of d-c motors, as well as starters and controllers for a-c motors, are also provided. Brakes operated by Thrustors, a-c or d-c solenoids illustrate various methods for stopping motors rapidly.

Illumination Laboratory

One of the important loads on a power system is the lighting load. Accordingly, the design of more efficient light sources and luminaires, and the development of better instruments and techniques for measuring such quantities as light output, brightness, etc. are problems related to the field of power engineering.

The illumination laboratory provides for investigations in this field. The facilities include several photometer benches, some equipped with universal lamp rotators, illuminometers, and with brightness, visibility and foot-candle meters. Spheres are used to measure the lumen output of sources, and also to determine the transmission and reflection factors of various materials. A variety of light sources, including fluorescent sodium and mercury vapor, and primary standard lamps are also available.

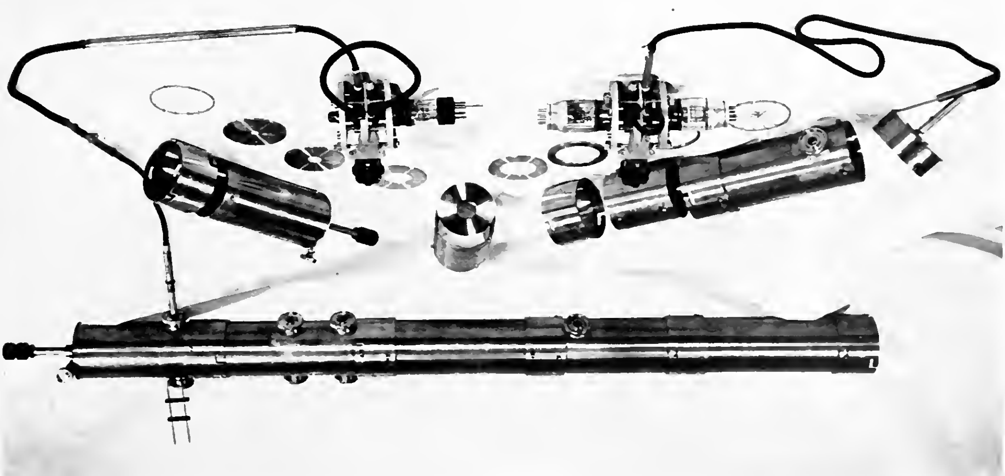
ELECTRONICS AND COMMUNICATION LABORATORIES

In order to provide the space and facilities required to accommodate an expanded communication course, new laboratories were constructed at the Lewis Institute Branch this year. These laboratories are used in conjunction with day and evening courses designed to train men in electronics and communication for the Defense Program and for industry in general. The courses include introductory work in radio, studies in modern radio practice, radio measurements, advanced radio and ultra-high-frequency phenomena. Dr. Sarbacher and Dr. Edson of the Electrical Engineering Department are in charge of the more advanced courses.

The laboratories consist of one large room, a smaller room which has been electrically shielded, and a small shop. More than fifty bench-positions have been provided, each accommodating two students. Direct and alternating current power are supplied to each position, in addition to special connections to ground and to standard signal circuits.

The electrically-shielded room is used to test sensitive radio equipment. The construction of such a room is, in itself, quite interesting. Two separate shields, one inside the other, are used, and great care is taken that no gaps occur in the electrical conductor used for this purpose. Ordinarily,

Fig. 5. Klystron tubes and ultra-high frequency wave guides.



copper wire cloth, similar to that used in screens, is used. A door which provides access to the shielded enclosure, presented a special problem. Evidently solid metallic connections could not be maintained since the door must swing freely. This problem was solved by means of brass strips, similar to ordinary weather-stripping, which were placed around the door. These were so arranged that the screen on the door makes contact through the brass strips to the screen which forms the walls of the room.

The experiments for the radio and ultra-high frequency courses have been built at the Institute. These experiments have been prepared with special consideration of the problem of visualizing the operation of electronic circuits. The complete wiring arrangement is drawn on the front of the panel and each piece of apparatus is mounted behind the panel in correspondence to the drawing. Thus, the student finds it easy to associate the wiring symbols with the actual parts and to study the arrangement of these parts and their function in the performance of the system. The hardwood housings provided for these panels serve to enhance their appearance and to protect them from injury in handling. Each unit is, insofar as possible, completely self-contained so as to simplify the problem of connections. A typical unit is shown in Fig. 4.

Ultra-high-frequency waves are similar to waves of light. With suitable apparatus it is possible to demonstrate most of the phenomena of geometrical optics. The waves are reflected from flat surfaces and, by curved reflectors, may be formed into beams. They may be refracted by suitable prisms, and focussed by means of lenses. It is also possible to guide these waves along curved paths by the use of insulating rods. Paraffin or lucite may be used for these purposes. Diffraction may be readily demonstrated, since the wavelength is comparable to the dimensions of easily-formed mechanical devices.

The wave guides, resonators and connectors for several ultra-high-frequency experiments have been built at the Institute. Some of this equipment is shown in Fig. 5. These guides and resonators are used in the study of the propagation and modes of vibration of ultra-high-frequency waves. Round and rectangular guides are used, and with the aid of probes it is possible to determine the configuration of the field inside the guide as well as the type of wave generated. Polarized waves, for example, are easily produced by these methods. The fact that the waves are polarized may be demonstrated with the aid of a frame across which a parallel system of wires is stretched. If the wires are at right angles to the electric wave, it passes through unaffected. If, however, the wires are parallel to the electric wave it is reflected as perfectly as it would be from a solid sheet of metal.

Lecher wire systems consisting of copper wires stretched parallel to each other are used considerably in this work. With this system it is possible to measure wavelength, power, and other important properties of these waves. The Lecher wire systems installed in the laboratory are arranged so as to be unusually convenient and rapid in manipulation.

Special tubes are necessary for the production of these very high frequencies. Some of these tubes are similar to conventional radio tubes and function in much the same way. Others, seemingly similar to conventional tubes, work in a very different manner and certain tubes, such as the klystron, neither look nor operate like conventional tubes. Three klystrons will be used in the laboratory for experiments upon generation, propagation, and reflection of very short radio waves. Although other devices will generate these short waves, the klystron is the only available tube which serves as a successful amplifier for these frequencies.

The development of these special tubes for very high frequencies has opened an almost entirely new field of engineering. A number of very useful and important applications have been made, several of which are of great military value and hence are closely guarded. It has been predicted that post-war developments in this field will be of far-reaching importance in many fields of endeavor.

RESEARCH INVESTIGATIONS IN THE ELECTRICAL ENGINEERING DEPARTMENT

The research interests of the Electrical Engineering staff include a wide variety of topics. Some of these are as follows:

Transformer Magnetizing Inrush Current (Hobson)

Overvoltages Produced by Interruption of Transformer Magnetizing Current (Hobson)

Analytic Study of Electrostatic and Electromagnetic Induction in Communication Circuits (Hobson)

Application of Symmetrical Components to Transient Analyses (Hobson)

Application of Matrix Algebra to Symmetrical Components (Reed)

Linear Network Transformation (Reed)

Positive Grid High Frequency Oscillators (Sarbacher)

Power Oscillation and Amplifiers (Sarbacher)

Frequency Stability in Oscillators (Edson)

Regulated Power Supplies (Edson)

Magnetron and Klystron Oscillators (Sarbacher and Edson)

Study of Electrical Insulators at Elevated Temperatures (Andres)

Investigation of the Corrosion of Metal and Alloy Electrodes under Arcing Conditions (Andres)

Investigation of Brush Materials, other than Carbon, Suitable for D-C Machines (Andres)

Analysis of Rectifier Filter Circuits (Anderson)

Analysis of Ferroresonant Circuits (Anderson)

It is anticipated that with the improved and expanded laboratory facilities, greater opportunity for research will be available in the Electrical Engineering Department than has existed heretofore.

OUR WARTIME CALENDAR

Everyone knows that there is a shortage of engineers. The armed forces and the industries are asking the colleges of engineering for many more men than are available.

The Institute has put into effect an accelerated program, which provides for ending the current school year May 14, four weeks earlier than is specified in the calendar published in the Bulletin. To make this possible, the midyear recess, the spring recess and junior week have been eliminated, and final examinations have been scheduled to be given during class periods.

The present junior class will report June 1 for full-time class work during a summer term, which will have a program corresponding to that of the regular first semester, and will end September 19. Regular students in lower classes will not attend during the summer term.

Registration for the fall semester will begin September 21. During that semester, seniors will have regular second-semester programs; other classes will be doing regular first-semester work.

The class of 1943 will graduate February 3.

UNUSUAL ENGINEERING OPPORTUNITIES IN PUBLIC HEALTH WORK

By

HERMAN N. BUNDESON, M.D.

Since the engineer is a keen student of technology, through his efforts man has been relieved of much drudgery. His greatest effort has invariably been directed toward improving man's environment. Because he has been mindful of man's physiologic responses, he has given much thought to those phases of public health which have materially helped in the struggle against disease. In the future, increasing effort will be required to solve the problems connected with improvement in public health.

The engineer at times fails to appreciate the significance of his work in relation to public health. If, in the past, the engineer had taken the interest which he now shows in the field of public health, this world would be a still better place in which to live.

It is realized by public health officials that many of the developments in physics and chemistry, when applied by all branches of engineering in controlling disease, result in noteworthy progress. They view with great satisfaction the major activities of the engineer in such fields as water-safety control, sewage disposal, and mosquito control. Yet is is only in recent times that the significance of the work of the industrial engineer in the control of diseases common in industry and resulting from infectious as well as from toxic substances found in industrial plants has been realized. In this field, the engineer may eventually perform outstanding service. In considering this problem, certain basic relationships should be understood and a rational approach made.

Man is greatly influenced in his everyday life by requirements which are fundamental for his existence. His first need is sustenance. Following this is his well-being, necessary to carry on life. This state of well-being has a profound effect upon man's willingness to work, his attitude toward work, efficiency, desire to undertake new and difficult tasks, ingenuity, and other characteristics. The backbone of modern industry is in the persons of whom it is composed. Without keen, active, and willing workers, industry cannot prosper.

If the engineer is to contribute his share in the promotion of those industries where personnel plays an important part, particularly the defense industries, he must not only consider the numerous economic problems that are a part of his routine assignment, but must also help to provide for the health and well-being of the employes.

There are several types of activities in industry in which the engineer's efforts are essential in protecting public health. A proper environment must be provided for employes, so that health hazards, whether from infections or poisons, are avoided. This does not mean that substances used in manufacturing which are dangerous or detrimental to health must necessarily

Close local exhaust for small lead pots.

be eliminated. If, however, a dangerous substance is used, the engineer is required to have knowledge of its properties and to know how to control its use so that its dangers may be eliminated.

There are hundreds of substances used in industry which are dangerous and detrimental to health in varying concentrations. Many of these substances are used in certain plants in such a way that no health hazard results. On the other hand, these same substances, under slightly different conditions of manufacture, have caused considerable illness. This sometimes occurs because new materials are used by an old established industry under methods which do not provide proper protection for the employe against their hazards.

The engineer should be mindful of the necessity for investigating carefully the properties of any new substance to be used in industry, particularly its toxicology. He must then, in turn, cooperate in designing machinery and equipment for the manufacture of new products utilizing dangerous substances, so that harmful effects on the employes may be prevented.

Toxic substances used in industry are both inorganic and organic. They include gases, liquids, and solids, separately and in combination.

Much of the control of the environment of man in industry, to prevent his being exposed to hazardous substances, has to do with purity of the air. The engineer, in his consideration of the air, is interested in the prevention of contamination. He must prevent this contamination without unnecessarily or unduly interfering with the processes of manufacture. Frequently, the engineer can, by the use of his ingenuity, design equipment or machinery that will do the desired job and yet be entirely enclosed. Thus, no part of the emissions from the operations enter the air breathed by the men working in the plant. This procedure, at times, is costly, although in a number of cases it has been found to be practical. There are certain advantages which this type of control has over any other. It affords a maximum of protection for the employe and reduces the operating cost below that of systems that are not completely enclosed.

When it is impractical to have a system totally enclosed, the engineer may design the apparatus to partially enclose the manufacturing processes. Systems of this type are planned to prevent toxic and noxious substances from escaping through the partial openings in the equipment. The more carefully the system is designed, with

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Close local exhaust for assembly line. Note sleeves on main exhaust line which permit relocation of drop hoods.

Below: Partially enclosed local exhaust. Restricts opening and protects against cross drafts.

METALLURGICAL RESEARCH IN THE ARMOUR RESEARCH FOUNDATION

By

RAYMOND G. SPENCER

The Armour Research Foundation owes its success to its ability to bring the techniques and skills of research and the accumulated knowledge of science to bear upon the problems of industry. To fit into such an organization, each research man must have a deep and broad knowledge of some branch of physical science; he must possess the spirit of research and a knowledge of research techniques. The knowledge of research techniques is acquired by experience, the experience of having attacked a tough problem and having found the answer, the experience of having done something that could not be done. Our research men possess these qualities.

The ultimate goal of industry should be to put all of its processes on a scientific footing. Every industrial process should be a well worked out scientific procedure, rather than an art. Metallurgical research has progressed rather rapidly, especially during the last decade; but anyone who is acquainted with the metals industry must certainly realize that many of the expedients that are employed are archaic and unscientific, that many of the commonly accepted so-called "facts" are not facts at all.

Broadly speaking, the aim of the Division of Metallurgical Research is

Core-blowing machine.

to utilize the existing knowledge of the basic sciences, physics and chemistry, wherever and whenever it is applicable, and, when this is not sufficient to solve the problem, to develop whatever new knowledge may be necessary. This, of course, as anyone who is aware of the difficulties will know, is an ambitious aim. Many of our attempts to solve a particular problem meet with failure; many of them are successful. The rapid growth of the Armour Research Foundation is proof of the success of its methods, of the success of its research techniques, and of the ability of its research staff. The method of attacking industrial research problems at the Armour Research Foundation is distinctive. Each project that comes to the Foundation is the responsibility of the Foundation itself, rather than the responsibility of an individual research man. If the administration decides that a project can be handled best by the Division of Metallurgical Research, it is assigned to that division. This project then becomes the direct responsibility of the chairman of that division. He, in turn, assigns it to one or two members of his staff, who devote their full time to it. The chairman then acts as an advisor and consultant. In some instances, he may be able to give constructive advice; in others, he merely suggests that other members of the staff be consulted about the particular problem. Each project, thus, has the undivided attention of one or two men, and the advantage of consultation of many men. The value of this procedure becomes evident, if one realies that on the staff there are experts in every branch of science that might be applicable to industrial research.

BUILDINGS AND EQUIPMENT

A new building with 500,000 cubic feet of space is under construction. This building with its equipment will represent an investment of $250,000 when it is completed. One section of the building is up and ready for equipment to be installed; one of the first pieces of equipment to be installed will be a $20,000 induction furnace. This furnace is to be used in the immediate future to expedite the research on steel castings being carried out for the American Steel Foundries. It is a furnace built especially for research work, with a power unit which produces unusually high frequency current.

1,000-ton hydraulic forging press.

An $18,000 one-thousand-ton hydraulic forging-press has recently been installed in the experimental foundry building and put into operation. The press is now being used to do research on non-ferrous forging. The great increase in the use and availability of non-ferrous metals makes better methods of forging them especially significant.

A small rolling-mill, driven by a 25 HP motor and equipped with both smooth and grooved rolls, is available for research. This rolling mill is being used in conjunction with our research on methods of improving the techniques of wire drawing.

The metallurgical division is well supplied with X-ray diffraction equipment. X-ray diffraction studies have a wide range of application in metallurgy as well as in other branches of industrial research. One of the most fruitful fields of research in recent years has been the studies of alloys. X-ray diffraction techniques have contributed much to the success of these

Photograph of a cast of the hole in a wire-drawing die. The smallest diameter is 0.037". By inspection of photographs like this, the nature of die wear may be determined.

researches. From studies of diffraction patterns, research scientists are able to determine the fundamental nature of any alloy that they make and to predict something about what new alloys may be possible and useful. X-ray diffraction can also be used to determine what changes in structure and texture of metal are produced by cold working, forging, straining, etc. They can even be used to find out why metal fails from fatigue.

The cupola, which has been in operation in the experimental foundry, will be moved and put into operation in the new building. A new traveling crane is being installed to service this cupola.

Rather complete sand-testing equipment, core ovens, and a core blower are in operation and are being used to expedite various research projects.

A controlled-atmosphere heat-treating furnace and a draw furnace are on hand to be installed in the new building.

RESEARCH PROJECTS

Molding is one of the oldest practices in metallurgy, and sand is probably the oldest molding material. Many hundreds of years ago sand was used to confine molten metal so that it would solidify in the desired shape. It is still the most widely used molding material, but it is certainly not completely satisfactory. We are attempting to find methods of treating sand so that it will be more satisfactory; we are also developing other molding materials and methods.

Extensive research on special methods of casting steel is in progress. This work is in charge of Dr. Thomas C. Poulter, Scientific Director of the Foundation. New methods of pressure-casting and counter-gravity casting in permanent molds have been developed. The counter-gravity method has been shown to be applicable to the casting of complicated steel shapes.

Work on dolomite refractories has been in progress for several years. With the heavy demand for steel imposed by the war program, clinker-dolomite refractories for open hearth furnaces assume added importance.

Electroplating of metal parts is one of the most common ways of putting corrosion resistant surfaces on metals. A very extensive research project on electroplating is in progress. Two of the most important considerations in electroplating in our present wartime economy are speed and saving of metal. The war has cut off most of the sources of supply of some of the metals used in plating. We are attempting to find ways of getting superior electroplated surfaces which require less metal and, at the same time,

Metallurgical Microscope, X-ray Diffraction Apparatus and a Photomicrograph.

find methods of doing the plating faster. One can get some idea of the importance of electroplating in modern industry, if he calls to mind the fact that twelve billion tinplated cans are used annually by the food industry.

Modern industry requires hundreds of thousands of miles of wire—iron wire, steel wire, copper wire, tungsten wire—all kinds of wire. The war has increased the demand for wire enormously. The wire industry is running to capacity in an attempt to meet this demand. Metal billets which go into wire are first hot-rolled down to small rods. These rods are then drawn cold through die after die until they are reduced to the desired wire-size. Dies naturally wear out. We are studying the nature and cause of die wear in an attempt to find ways of reducing the wear of dies that are now used, and to find out how to make better wire-drawing dies. We have developed special methods and techniques for making these studies. We are also studying other aspects of wire drawing with the view of making better wire.

Open-hearth steel, the colossus of modern industry, also comes in for some attention. The slags formed in the open-hearth furnaces are complicated and not too well understood. For more than a year we have carried on studies of open-hearth slags. Our petrographers have been busy studying and analyzing the complicated mineral structures of slag. The work is still going on.

Metals have been forged for centuries. The practice began with simple hand-forging and developed so that now forging is done with presses that develop pressure amounting to several thousands of tons. Some of the modern alloys are especially difficult to forge. Extensive research on forging is in progress.

The work now in progress in the metallurgical division is sponsored by the following companies: American Steel Foundries, Inland Steel Company, Marblehead Lime Company, National-Standard Company, Revere Copper and Brass Incorporated, and Wehr Steel Company.

MORE ARCHITECTS WANTED

Architects are being sought to fill Federal positions in the war program, it was announced recently by the Civil Service Commission at Washington. Optional fields of architecture in which persons may qualify are design, specifications, and estimating. The salaries range from $2,000 for junior architect to $3,200 a year for associate architect. Sufficient eligibles at these grades to meet anticipated government needs were not obtained from the architect examination announced a year ago. No written test is required. Applicants' qualifications will be determined from their experience and training.

Architects appointed in design will survey work under construction, and do research in the factors affecting architectural design. Persons working in specifications will write architectural specifications requiring knowledge of all classes of craftsmanship and materials. The duties of persons appointed for estimating work will be to estimate from sketches the costs involved in all phases of building.

For the $2,000 positions, completion of a four-year architectural or architectural engineering course at a recognized college or university is required. Senior students who will complete their college courses within six months from the date of filing application may apply. For the other positions work in one of the options over a two-year period must be shown, in addition to appropriate architectural or engineering education or experience. Experience as draftsman, involving routine drafting or developing of plans not requiring basic original investigations or developments, will not be considered as qualifying. There are no age limits.

Qualified persons are urged to apply at once. Applications will be accepted at the Commissioner's Washington office until the needs of the service have been met. Forms for applying may be obtained at first- and second-class post offices throughout the country, or direct from the Commission.

ELIMINATING WASTE IN WARTIME

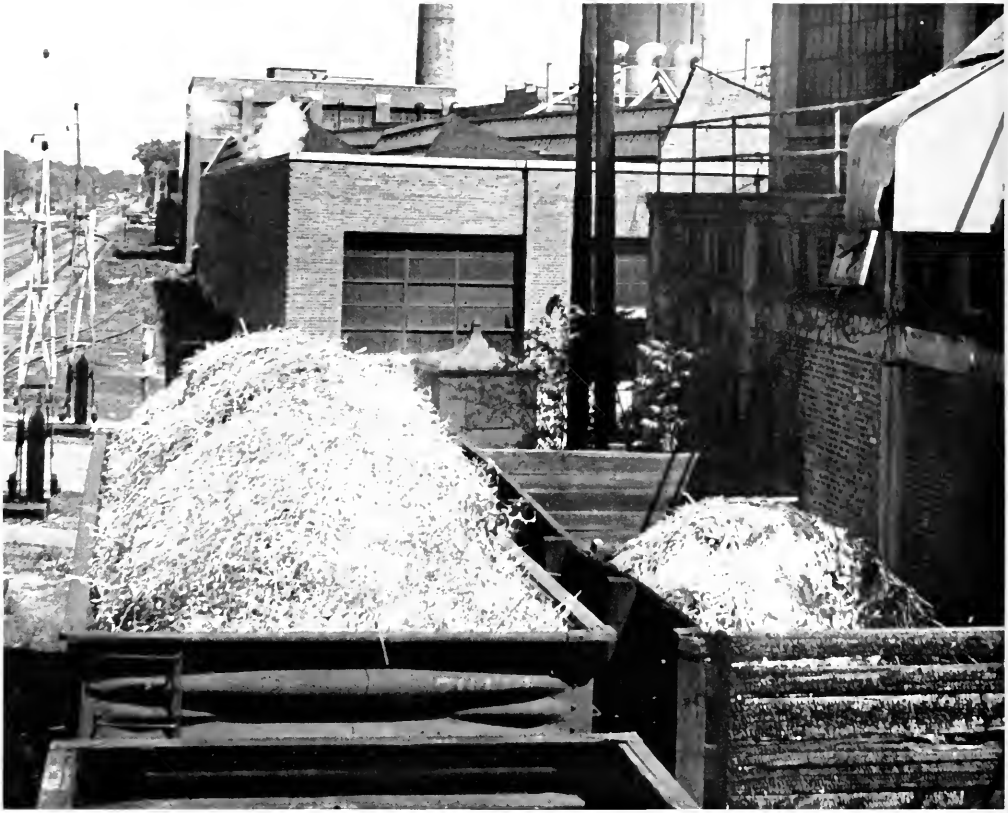
By

H. P. DUTTON

Few fail to feel the urgency of the times. We face shortages of material which in turn create other shortages, knocking critical materials out like ninepins; and it becomes apparent that the labor shortage may, before the end of the year, become nearly as serious as the material shortage. We cannot afford waste.

The general lines of the campaign to reduce waste are not new. Companies like Westinghouse were carrying out effective waste reduction campaigns, with such features as displays, with cost figures, of spoiled tools and materials, ten or fifteen years ago; and many companies such as Eastman Kodak, General Motors and Western Electric have for years employed specialists in salvaging and reclamation. What is new is the potential of in-

Survey the plant for wastes of strategic materials, machine capacity and labor.



Segregation and systematic handling increase the value of scrap.

terest among employees. It is their war, as well as ours. If we do not run it to their liking, we shall hear from them. They, too, realize the need to reduce waste.

There are three phases to the problem of salvaging industrial wastes. The problem is first of all a technical, an engineering problem. What wastes are worth salvaging? The shortages of essential materials give quite different values to that cost equation today. How collect and classify recoverable wastes, preserve them from from contamination? Here there is well established the principle of separation and prompt identification at the source, of chips, punchins, and other wastes, and of assembly of like materials. One company recovered 77.6 percent of metal scrap containing only one alloy or metal, 10.3 percent of a mixture of two, 6 percent of a mixture of three. Finally comes the phase of advantageous disposal, which involves a knowledge of markets and acquaintance with dealers.

For a company first studying its waste disposal problem, a survey should be made of all sources of waste. Indeed, every company should make such surveys periodically. One company with an established salvage department made an independent survey and discovered hundreds of tons of scrap. One has obsolete product or an old machine on hand, and defers its disposal in the lingering hope that it can be sold or used. Next year the same decision is made. Presently everyone takes it for granted. This year, of all years, these blind spots must be discovered.

One aid in seeing such blind spots is to call in people who do not know your business too well. The use of the consultant is an established practice, but the plan of the Erie Manufacturers' Association has possibilities. The Association tackled the salvage problem as a group, appointed committees for the purpose of surveying plants, advising on procedures, and supplying speakers and posters. Or a group might follow the plan once used by members of the New England Council, a group of representatives from eleven plants calling each month in rotation on the plant of the twelfth, examining procedures and making recommendations.

The inventory of possible sources of waste is long and it is not confined to scrap materials. Any check list for waste elimination should go into the following questions at least:

Are chips, stampings, waste copper wire, solvents, and the like properly reclaimed?

Are products designed for economy of materials, using substitutes, where possible, for critical materials?

Are supplies, such as packing lumber, cutting and lubricating oils, waste and rags, stationery cartons and containers, reclaimed and re-used? Hundreds of examples of ingenious reclamation have been published and may well be studied for suggestions.

Are broken tools and obsolete machines reconditioned where possible or disposed of systematically? Are tools and equipment systematically cleaned and maintained?

Do all items of existing equipment justify their existence? If not, they should be sold, scrapped or put to other uses. One company made a study of its steam and water piping system, which had grown by taking leads off at the most convenient places as needs arose. A re-layout took miles of surplus pipe out of the system for other uses and reduced heat losses.

In addition to these items dealing with material salvage, there are other wastes equally important.

Is there full use of capacity; are equipment and men employed to advantage; is the scheduling system effective?

Is inventory effectively controlled? One company, by a closer tie-up of sales estimates and schedules, was able to reduce its inventory by a million and a quarter dollars. The material situation is complex today, but that very complexity points to the need of systematic, mathematical control. There is evidence of increased interest in economic lot sizes and similar controls.

Is power used to advantage? Steam users may with profit survey their operations for heat balance—the bleeding of live steam for power, the use of exhaust steam and of waste hot water for heating feed water, the control of combustion and the metering of power to departments. Considerable economies are possible in the purchase of electricity, in the way of off-peak purchase, improvement of power factor, and reduction of maximum demand.

All of these leakages are old standbys. That is the trouble. If you were to go through your plant tomorrow, with your eyes really alert to every one of these sources of loss of critical materials and man-hours, you would almost certainly see many unsuspected accumulations and leakages. The trouble is, we get used to them, become blind to them. So do workmen. So the second basic step, after the plan is laid out, is to awaken people to the existence of these wastes, to make them see. Here, something spectacular and new may help. There was a manufacturer whose employees were careless in strewing cartridge shells on the floor. One night he scattered handfuls of dimes and quarters about. After the general scramble the next day, he announced that there really had been no more money lying around that morning than usual; every one of the cartridges these men were so careless with was worth more than each dime they had found.

Displays of broken parts with cost figures are often useful; it is especially useful to acquaint both men and foremen with the money value of materials. If a man knows that a little milling cutter may cost thirty dollars he is likely to be more careful of it than if he thought of it as just something the storeroom always had plenty of. Or there may be clean-ups, with prizes for the cleanest department.

Much the same problem is met here as in safety campaigns—the keeping up of interest in and attention to an unvarying, routine, undramatic need. How silly it seems to bother with turning out the lights or saving a sheet of paper! The answer is to use the vaudeville formula—a high-lighting of one show at a time, and a succession of shows, now salvage, now safety and first aid, now motion economy, and so on, each running long enough to make a point and make it stick.

The third step in the campaign is follow-up. You remember Micawber, who at long last satisfying a creditor with a promissory note, turns to a friend and remarks: "Thank God, that debt's paid." There is some danger that, having staged a grand show on salvaging, worked up a good emotional glow, and resurrected several tons of scrap, we will forthwith discharge the subject from our minds and return to our accustomed ways.

One provision for follow-up is the assignment of specific responsibility. In any plant where volume warrants, one man should be in charge of salvage operations. A second, and perhaps the most effective, follow-up is the special province of the group of cost men—cost control and cost standards. In this connection, the flexible budget, when used in connection with an engineering analysis of performance standards, is most effective.

No campaign of waste elimination can stop with materials and machinery. Nearly all firms are passing through the throes of either an expansion or a contraction of labor force. Few indeed escape the problem of replacements, as men are called to the national service, or are attracted by opportunities in the defense industries. All these things mean a higher ratio of learners, and learners cost heavily in scrap, in reduced output and use of plant capacity, in increased accidents, in increased supervision. One of the key points in today's situation is the rapid training of new help and upgrading of employees for promotion. Here the need has caused us to do things we would not have believed possible. One firm is training foremen (preferably but not necessarily from skilled workers) in six to nine months of personal supervision and carefully graded increases of responsibility. Lens grinding, which it used to be thought demanded years of training, has been analyzed, the difficult knacks conquered and reduced to plain instructions, and can be taught to beginners in a few weeks' time. In general, firms increasing their force rapidly are finding it helpful to increase the ratio of machine-setters and supervisors and, where the rate of hiring is large, to employ full-time instructors (drawn from their own foremen or leading workmen) to relieve the other heavily loaded foremen. In this connection, firms which have war work should investigate the very successful "Job Instructor Training" program put on without cost to the company by the Training within Industry Division of the War Production Board.

Waste elimination is clearly a big order for an already busy firm. One recalls the plight of the celebrated chameleon, who obliged successfully on a brown coat, then on a green one, but was put on a Scotchman's plaid and died in the performance of his duty. There are so many calls on the energies and attention of foremen, men and general management. If we are to avoid verging upon a mere aimless hysteria, it is necessary that someone shall pull all these imperative but sometimes incompatible calls into a program. There never was a time when it was more essential for a company to be in touch with all these swiftly changing needs, but there must be a quiet, collected switchboard which takes the incoming calls, routes them to the proper person or action, integrates them into a program and insulates as much as possible of the working force from the bustle and confusion.

In conclusion, there is one point which deserves thoughtful consideration in our effort to rise to the needs of the war time economy. Last night I heard over the radio a new tune; the gist of its refrain was, "Somebody's chance for glory, somebody else's, not mine." There are workers, as there are managements, who view the present situation solely from the standpoint of selfish profit and avoidance of risks. But there is evidence that the song, biting though its inferences are, does not reflect the ideas of the average American. We need the help of labor. We know that in England, it was only when labor made its voice felt against the timid councils of the

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BETTER MOUSE TRAPS

Noise denotes inefficiency, wasted power, lost energy. In earlier years it was believed that a noisy place was a busy one. And so it was. But now the noisy places have been quieted, and therefore, are more efficient, and consequently even more busy than ever before.

Acoustical engineering is a comparatively new profession. We have come to realize the important part played by sound in our modern way of life—in the school, the office, the factory. Much has already been done, and a great deal more remains to be done. In no other branch of physics are the measurements so difficult to perform, and the theory so simple. Recent developments in electronics now make available new tools immeasurably more powerful than those previously employed, with consequent improvement in measuring technique.

For the noise reduction of air-borne sounds and the acoustical correction of rooms, many types of sound absorption materials have been developed. The modern scientific concept of acoustics dates back only fifty years; although the effects of sound-absorbing materials have been known since then, the accurate measurement of the sound absorption coefficients of these materials is still one of the major problems. Even now, the most common and generally accepted method of measurement of the coefficients often leads to values in excess of 100 percent—and in some instances as high as 125 percent. This would indicate that these materials absorb more sound energy than is actually generated! This is, of course, impossible, and these erroneous values are the result of unsatisfactory technique.

The sound-absorbing coefficient of a material is that percent of the total sound energy which strikes the material and is not reflected back from it.

In a closed room, an open window is considered to be 100 percent absorptive. All the sound energy striking this area is assumed to pass through the opening without being reflected as it is from the other boundaries of the room. Although this is not, strictly speaking, a correct assumption, it will serve as an illustration. To continue with it, the material of which the coefficient is to be measured is substituted for the open window, and the reflection of sound energy from it is then measured. This value, subtracted from 100 percent, is the sound-absorption coefficient. This is theory.

In practice, the commonly accepted method of test is to place 72 square feet of the material in a large (about 10,000 cu. ft. to 20,000 cu. ft.) tightly closed room, specially constructed to keep out extraneous noise so that it will not interfere with the test.

The walls of this room, called a reverberation chamber, are made as non-absorptive as possible. A sound of known intensity level is generated within the room, usually by means of an electronic audio-frequency oscillator operating one or more typical dynamic loud-speakers. When the

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Above: Sample End of Acoustic Tube Showing Microphone Carriage.

Below: Loud Speaker End Showing Measuring Apparatus.

She's a good friend of yours—

The girl behind "the voice with a smile" is known to everyone. You have learned to count on her in daily telephone calls as well as when emergencies come.

Now meet her sister

—also a Bell System girl. She's your friend, too, although you've never heard her voice. Here she is on the final telephone assembly line at one of Western Electric's great plants. Like the fifteen thousand other women in the Company, she does her work well. She's proud of the part she plays in making telephone equipment for this Nation . . . and for the armed forces of the United Nations.

Western Electric

. . . is back of your Bell Telephone service

FOR VICTORY
...keep buying Defense Bonds

GOOD NEIGHBORS

The Armour Research Foundation has been commissioned by the Argentine Trade Promotion Corporation to make an industrial survey of Argentina and its raw materials and products—those words were blazoned across the nation's press in the lead of a news story that once again gave evidence of the great "Technology Center" that is being created at Illinois Institute of Technology. To make the survey, the Armour Research Foundation, which is located at and affiliated with Illinois Institute of Technology, will send a field party to Argentina. The Armour representatives will spend from six months to one year there.

The main purpose will be to study raw materials in Argentina with a view to their immediate possibilities for development for export and for use in domestic industrialization. The results are expected to aid in the export-import relations of Argentina, the improvement of which is the ultimate aim of the study.

It will be the first independent, noncommercial survey ever made in Argentina, according to the officials of the Argentine corporation.

"We shall not spend much time in analyzing specific problems but will try to reveal problems for subsequent analysis," says Harold Vagtborg, director of the Armour Research Foundation. A tour of South America made earlier by Mr. Vagtborg laid the groundwork for this survey. He accompanied the recent National Research Council South American tour of industrial exploration.

Dr. Francis Godwin, assistant director of the Research Foundation, who will be in charge of the field party, outlines a three-point system by which the project will be attacked:

1. The Armour Research Foundation will take to Argentina the technology of the United States.

2. The field party will be alert to discern new methods of industrialization which may be applicable to Argentina but not to the United States because of local conditions.

3. The party will look for opportunities to tap new resources.

Also, the work of the field party will be co-ordinated with further work and study of specific projects carried on in the laboratories of the Armour Research Foundation in Chicago. A large portion of the scientific staff of the Foundation is expected to be involved in the project.

Three scientists, all of whom hold doctor's degrees and are noted for research, will make up the field party.

Dr. Godwin, as aforementioned, will head the group. He holds his Ph.D. from the University of Iowa and is already noted for his work at the Foundation. He directed a study in colloidal fuels which resulted in a stock car being driven through the streets of Chicago powered by "liquid fuel." He helped build a device which enabled a bullet to photograph itself in flight with the unbelievably short exposure of one-millionth of a second.

A member of the staff of the Foundation and of the faculty at Illinois Tech since 1938, Dr. Godwin has been instrumental in the work that has made the institutions famous for their efforts in behalf of industry.

Dr. Godwin will be assisted by Dr. John A. Schellenberger, who will work in the field of agricultural biochemistry, and Dr. John A. Hopkins, who will work in agricultural and industrial engineering.

Dr. Schellenberger, who holds his Ph.D. degree from the University of Minnesota, was director of biochemistry for Rohm and Haas Company in Philadelphia, Pa., before joining the staff at the Research Foundation for this survey.

Already noted for this type of work, having been in charge of the agricultural section of a similar party organized in the United States by the National Research Council, Dr. Hopkins has been called from a faculty post at Iowa State College, Ames, Ia., to join the party. He has been granted leave of absence from his teaching for the duration of the Argentine survey. Dr. Hopkins holds his Ph.D. degree from Harvard.

In all, the field party will include seven persons, for each man will be accompanied by his wife, and Dr. Godwin's small son will also make the trip.

The field party left Chicago on Tuesday, March 24, going from Chicago to Miami, where two days were spent, and thence to Buenos Aires by Pan-American Clipper.

All arrangements for the survey were made with J. B. Thomas, New York representative of the Argentine Trade Promotion Corporation. Mr. Thomas, a United States citizen, spent seven years as manager of the U. S. A. Chamber of Commerce in Argentina; prior to that time he was manager of the Buenos Aires branch of the Fisk Tire Export Company and had several years' experience in Colombia, Peru, Ecuador, Bolivia, and Brazil.

The Argentine Trade Promotion Corporation—an important example of a cooperative agency by which a government finances operations and private business provides merchandising experience—is an organization which seeks wider export markets for non-competitive raw and finished products of the Argentine.

The APTC, which has some resemblance to alphabetical agencies such as the RFC, and the HOLC., was created by a special Argentine government decree in May, 1941. The corporation began its activity in Buenos Aires on June 15, 1941, and in August, 1941, opened a New York office. It has an authorized capital of a million pesos, but is not dependent upon these funds to carry on its work. It has revenue which is obtained through a governmental decree which authorizes the corporation to purchase exchange from exporters of some two hundred products not normally considered regular exports to the United States, and to sell this exchange to importers. Quotas on such American products amounted to approximately $11,200,000 for the year 1941. The export of products on the corporation's list actually produced dollar exchange for Argentina amounting to more than twice the amount of the quotas set up for importers.

The functions of the corporation, however, are purely promotional and do not include the buying and selling of merchandise. Markets for Argentine exports, manufactured goods, agricultural products, minerals and metals, are being secured, and Argentine producers are being put in touch with buyers, distributors and importers.

The Argentine Trade Promotion Corporation is concentrating its efforts toward the United States because of the new tendency toward hemispheric solidarity and because Argentina is rich in products which we have difficulty in obtaining or cannot obtain in the quantities desired.

Among Argentine products vital to the United States defense program

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"TO PROVIDE FOR THE COMMON DEFENSE, TO PROMOTE THE GENERAL WELFARE"

Bad medicine for big bombers

One way to spoil a bomber's aim is to hang a curtain of steel over your ship and dare him to come down through it. To get that curtain of steel up there requires quick-firing, flexible guns.

To the plant of the Westinghouse Electric Elevator Company the Navy, a few months ago, brought its plans for such a gun. And to Westinghouse was given the important job of building the mounts that would control the aiming of these batteries of quick-firing guns.

And the Navy said, "Well done!"

Today, over the Westinghouse plant, there floats the Navy's "E" pennant—for excellence—eloquent testimony to the manner in which this Westinghouse plant performed the job. How was this plant able to get into growing production of these mounts so quickly? The answer lies in a Westinghouse characteristic called "know how"—the ability to get things done in the best possible way.

This Westinghouse "know how" makes itself felt wherever Westinghouse craftsmen build things. Whether for the common defense or the general welfare, this "know how" is doing a job. The same skill and ingenuity that made so many splendid things for peacetime living are now being applied to many important war weapons.

"Know how" will work for you again

We look forward to the day when we can give your home, your farm, or your factory the full benefit of Westinghouse "know how" again. To speed that day means just one thing to us: to produce, in ever increasing quantities, the tools with which to get the victory job done.

Proudly We Hail Our 600

• No group at Westinghouse has met its responsibilities in our war effort with more zeal and ingenuity than the 600 young engineers who only last year were your college mates. Already, their work in research and design has made vital contributions to our country's drive for victory.

This year, hundreds who are now college seniors will find at Westinghouse, as perhaps nowhere else, an opportunity to apply their schooling and intelligence toward winning the war.

Westinghouse

"An Engineer's Company," Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

HELP!

HELP!

HELP!

The selective service is taking many engineers into the Army. Others, faced with going into the service as privates, are entering the Army or Navy as commissioned officers.

New factories, airdromes, air fields, fortifications, ships of war, cargo ships, yards and docks and research laboratories require trained engineers and trainees.

New planning still in the blue-print stage requires many more experienced engineers and trainees.

The shortage of necessary engineers right now is variously estimated from 100,000 upwards. The peak load has not yet arrived. Approximately 13,000 engineers will be graduated this May and June in the United States and Canada. Many of these young men, excellent timber, are signed up right now for the Army and Navy. Others will be inducted as privates; and others if they can pass the physical tests will apply for commissions.

What can be done to help relieve the shortage? That there is a shortage is evident because of the urge for more and more equipment and munitions, necessitating urgent requests for engineers in volume far exceeding the supply and the paying of salaries away above those prevalent three years ago.

All engineering students should be induced to stay in college until they finish their subjects and obtain degrees. Officers of the colleges should fill out Form 42A for engineering students and send it to the proper local draft boards. If a local draft board gives a rating of 1A to an engineering student in good standing, this rating should be protested to the Board of Appeals. The appeal should be made by an officer of the college. If the appeal board "cracks down" on the appeal, then its decision should be protested to the State Director of the Selective Service Draft System. The appeal should request a 2A classification because of the great shortage of engineers. The selective service boards have received various memoranda from time to time, apprising them of the various engineering branches in which acute shortages exist.

Industry must follow the same procedure for its trained engineers, that is, file Form 42A with the local draft board, and if the registrant is placed in 1A, file an appeal with the Board of Appeals, asking for reclassification to 2B. Send a duplicate of this appeal to the State Director of Selective Service, because he frequently will aid in granting your appeal. This appeal must be sent within the ten-day limit set on the notification card that is sent to the registrant.

This is a chore, and to some an unpatriotic procedure. In this emergency, when production of materials for war means so much, it is the employer's duty to be patriotic, and that means to fight for every man in his organization who is necessary for war production. If anyone needed for war production is difficult to replace or is non-replaceable, on account of the shortage of his kind, and if his loss will slow up, impair, or prevent production of war materials, it is up to you, Mr. Employer, to be patriotic and fight to the last ditch for your registrant's reclassification from 1A. That, and nothing less, is what your State Director of Selective Service expects of you.

Now as to young men just graduating this May and June. These men will be trainees in your organization. Before your trainee starts to work for you send to his local board documentary evidence that he is hired by you and that his employment is effective on a certain date. Send in your letter stating the qualifications of the registrant and that he is a "necessary man."

A "necessary man" is defined in Section 622.24, Selective Service Regulations, as follows:

A registrant shall be considered a "necessary man" in industry, business, employment, agricultural pursuit, governmental service, or in any other service or endeavor, including training or preparation therefor, only when all of these conditions exist:

(1) He is, or but for a seasonal or temporary interruption would be, engaged in such activity.

(2) He cannot be replaced because of a shortage of persons with his qualifications or skill in such activity; and

(3) his removal would cause a serious loss of effectiveness in such activity.

You can "go to bat" on all three of these for your trainees if your work involves a "critical occupation" hereinafter defined. If the local board does not place your registrant in 2B, file Form 42A; if that fails appeal to the Board of Appeals sending a copy of your appeal to the State Director. Remember, trained engineers and trainees are scarce, and if you really need them they are worth fighting for.

The bulletin, dated March 16, 1942, signed by General Lewis B. Hershey, Director of Selective Service System may be of some help in determining what a "necessary man" is. The salient features regarding engineers and college students are hereinafter presented.

In order to allocate manpower and to be assured that the activities essential to the prosecution of the war are properly developed and maintained, a new interpretation must now be placed on the phrases "national health, safety or interest" and "war production."

In the determination of who shall and who shall not be deferred by reason of his occupation in civilian activity, the Selective Service System must consider occupational classification in accordance with this new interpretation. This new interpretation will require a more careful consideration of the essential character of the activity in which the registrant is engaged, the occupation which the registrant holds in that activity, and the need for the registrant in that occupation.

Civilian Activities Supporting the War Effort

1. Selective Service Regulations provide that in Class 2A shall be placed any registrant who is found to be a "necessary man" in industry, business, employment, agricultural pursuit, governmental service, or any other service or endeavor, the maintenance of which is essential to the national health, safety or interest.
2. Now that we are at war the phrase "national health, safety, or interest" no longer includes mere convenience and comfort. Activities essential to the national health, safety, or interest are now limited to those activities other than war production, which support the war effort. Activities supporting the war effort include those activities which provide food, clothing, shelter, health, safety and other requisites of our daily life.
3. In order that an activity may be con-

The law sez only 6 to 1...
Search that man! He's got "33 to 1"
33 ? ! ! ! GOSH ALL HEMLOCK, HOW'D YOU DO IT ? ER— I MEAN THAT'S BAD, YOUNG FELLER.
WELL, WARDEN, HE WANTED THE PRIZE CATCH OF THE SEASON— AND HE GOT IT!
AS GAME WARDEN HERE, IT'S MY BOUNDEN DUTY TO TAKE YOU IN, YOUNG MAN!
YOU'RE THE ONE WHO'S "TAKEN IN," WARDEN. HE MEANT THESE 33 FINE BREWS, BLENDED INTO ONE GREAT BEER!
RIGHT— BLENDING'S WHAT GIVES IT THAT SWELL FLAVOR... TRY IT!
FLAVOR! EXTRA-DELICIOUS FLAVOR... BECAUSE PABST BLUE RIBBON, LIKE FINEST CHAMPAGNES, REACHES PERFECTION THROUGH BLENDING. IT'S SPECIALLY BLENDED "33 TO 1."
REGULAR SIZE
CLUB SIZE
PABST BLUE RIBBON BEER
Pabst Blue Ribbon
WELL, SNAP MY GAITERS! WHY DIDN'T YOU SAY YOU HAD A STRING OF PABST BLUE RIBBON! THIS IS MIGHTY GOOD!
NO "LIMIT" ON ENJOYMENT WHEN BEER IS BLENDED "33 TO 1," EH, WARDEN?
YOU'RE ALWAYS in luck with "33 to 1". Expert blending gives it a flavor that can't be copied... a mellow, sparkling goodness all its own. That's why it's America's leading beer at outings as well as in the home. Enjoy it today—in regular or club size bottles, and on draft at better places.
Copyright 1942, Pabst Brewing Company, Milwaukee
33 Fine Brews Blended into One Great Beer

sidered essential to the support of the war effort, its facilities must be predominantly devoted to that purpose."

Civilian Activities Necessary to War Production

1. Selective Service Regulations provide that in Class 2B shall be placed any registrant found to be a "necessary man" in any industry, business, employment, agricultural pursuit, governmental service, or other service or endeavor, the maintenance of which is necessary to the war production program.
2. With reference to civilian activities, the phrase "necessary to the war production program" now means the work of processing or producing ships, planes, tanks, guns and other machines, instruments, articles, and materials directly used in the prosecution of the war."
3. In order that an activity may be considered as necessary to war production, its facilities must be predominantly devoted to that purpose.

Critical Occupations

1. In order that a registrant may be considered a "necessary man" in an activity necessary to war production, or in any other activity essential to the support of the war effort, such registrant must be engaged in a critical occupation.
2. A critical occupation in any such activity is one which must be filled by a man with the required degree of training, qualification, or skill for the proper performance of the duties involved. Occupations in order to be considered critical occupations must be such that, unless they are filled by men with the required degree of training, qualifications, or skill, there will be a serious loss in the effectiveness of the activity.
3. Critical occupations exist only in activities which are necessary to war production or are essential to the support of the war effort. If the activity is neither necessary to war production nor essential to the support of the war effort, then no occupation within that activity can be considered.
4. Not all occupations within activities necessary to war production or essential to the support of the war effort are critical occupations. When an occupation within an activity necessary to war production or essential to the support of the war effort is not itself a critical occupation then, in such case, there is provided no grounds for occupational classification.

The following is relative to registrants in college:

If a registrant is in training and preparation in a recognized and accredited academic, professional, or technical college or university, it must be concluded that he will not have sufficiently demonstrated his ability to the extent that he gives promise of successfully completing such training and preparation, until approximately the satisfactory completion of the second academic year of his college work. It therefore, appears reasonable that no registrant should be given an occupational classifition as a necessary man in training and preparation until the close or approximately the close of the second academic year of his college work and then only if he has been accepted and enrolled for advanced training and preparation by a recognized and accredited college or university. In any event, such registrant at the close or approximately at the close of his second academic year and subsequently, must meet the tests for a necessary man in training and preparation for a critical occupation in an activity necessary to war production or essential to the support of the war effort.

This placement office is operated on a budget met by Illinois Institute of Technology. It exists as a service to its alumni and to industry.

One of the urgent needs in our placement department right now is for qualified engineers who are production men with experience in big industries handling thousands of men. There are about fifty-five requests in our office for such men at salaries of $7600 to $25,000 per year.

The Army and Navy are looking for hundreds of engineers for officer's commissions. The men must be thirty years to fifty-nine years old.

Requests are now beginning to roll in for women chemists, women draftsmen and women engineers.

It is with sincere regret I must announce that you alumni will lose the service in this office of Mrs. Constance Carroll. She is going to Baltimore to live, because of the transfer of her husband to that city. She has been a loyal and faithful worker with your best interests at heart. You, the college, and I will miss her. All of us wish her the best of everything.

John J. Schommer.

FACTS AND FIGURES ON E. S. M. D. T.

A steady stream of 6,446 men and women marching from academic halls into the waiting plants of industry—that is the picture of what Illinois Institute of Technology has done in defense training since January, 1941.

One of the first schools to begin training workers for defense industry after national defense became a coast-to-coast cry, Illinois Tech began its first special evening defense-training courses for persons not among the regular student body on Jan. 4, 1941 and ever since that date at least one training program has been in progress. Four are running currently.

It is estimated by the defense training office that at least 15,000 persons will have received certificates or diplomas when these four programs close, the last of them late in June. Those figures mean that approximately 9,000 men and women are now studying defense courses at Illinois Tech from five to six hours weekly in evening classes after a day's work.

Past accomplishments, however, without speculation as to final statistics on current programs, present a staggering picture.

Those 6,446 persons who have received certificates to date have spent an aggregate of 1,110,277 hours in defense classes—mostly at night—besides time spent studying outside the classroom. Translated into more comprehensible figures, that figure equals 46,261 days or 126 years, nine months and thirteen hours.

And if those 6,446 trained workers were to pass in a steady stream out the front door of Illinois Tech and into a defense plant at the rate of one each minute, the march would last for 107 hours—or four full days plus eleven hours.

Those 6,446 persons are enough workers to man a factory—if they were to work all in one plant—capable of producing five or six bombers daily, or more than 1,500 a year.

But the 6,000-odd persons did not study merely factory methods. They studied the engineering fundamentals of defense production, as the name of the courses — Engineering Defense Training courses—implies. They studied an aggregate of eighty-eight courses including tool design, concrete testing, diesel engineering, foreman

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America's unlimited source of Magnesium

EVEN TODAY with astronomical figures a commonplace, nine billion is a number sufficiently vast to jolt the attention of anyone except, perhaps, an astrophysicist.

Imagine trying to count up to nine billion! Yet that is the total you would have to reach if you counted every pound of magnesium that could be produced from a cubic mile of sea water.

When you recall that magnesium, lightest of all structural metals, is vital to the construction of airplanes and other war-time equipment, you begin to realize the importance of those nine billion pounds.

And when you read also that the production of airplanes to be reached by the end of 1943 is set at 185,000, it is reassuring that the ocean can be looked to for this precious weight-saving metal.

Magnesium is now being extracted from sea water. The metal has been rolling out since January, 1941—a chemical and engineering feat accomplished for the first time in history.

Fortunately, for our national defense program, Dow had been producing magnesium from brine since 1915. This had given American industry 25 years of experience in the characteristics and fabricating technique of magnesium.

It was this quarter century of magnesium production by its own American-developed processes that enabled Dow to solve the chemical engineering problem of tapping the inexhaustible waters of the sea as a basic magnesium source.

Within nine months after construction started on the coastal plant, the ocean was giving up its treasure. The waters of the sea were pouring in and the metal was rolling out in ever-mounting volume.

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York City, St. Louis, Chicago, San Francisco, Los Angeles, Seattle, Houston

THE SOCIETY OF SIGMA XI

On Wednesday, March 25, a worthy tribute was paid to the faculty for the important research that they have done and to the officials of Illinois Institute of Technology for fostering this scientific investigation. The tribute was in the form of an installation of a chapter of The Society of Sigma Xi.

In the late nineteenth century educational emphasis was still on the history of the distant past rather than the future. The classicists were interested mainly in the records of the Greeks and Romans. They had little respect for the questioning glance of the scientist toward the future. For over one hundred years Phi Beta Kappa had been honoring scholarship in the arts. There was little reward, however, for those with scientific training. At Cornell University, in 1886, a group of scientists and engineers founded a new society called Sigma Xi to recognize and reward excellence in science and scientific investigation. They saw the need of the research worker for personal contacts and comradeship with those thinking along the same lines. That Sigma Xi was to be a friendly organization is evidenced by its motto, "companions in zealous research."

Since 1886, the society has grown along with the recognition of the importance of science and scientific achievement until it now numbers eighty-four chapters and forty-two clubs, the difference between a chapter and a club being that the chapter may elect new members while the club cannot. The organization now has some 22,000 active members, with nearly 3,500 new members and associates elected annually. It publishes a quarterly magazine containing a wide variety of material covering every field of scientific endeavor. Research fellowships are maintained. Sigma Xi also sponsors seventy to eighty national lectures given by a group of five distinguished scientists selected anually. In addition to the selection and election of new members, the local chapters sponsor from two to ten lectures or meetings during an academic year.

Membership in the society has become a symbol of excellence in scientific research. In order to uphold this symbol the society has maintained high standards and made increasingly difficult the election to membership. In conjunction it also has raised higher and higher the requirements to be met by institutions desiring chapters.

With the advent of an accelerated research program at Armour Institute four years ago, a group of faculty and graduate students led by Dean L. E. Grinter and Robert Levy began to correspond with the national officers of Sigma Xi in regard to the establishment of a chapter of the Society of Sigma Xi at the Institute. At that time there existed at Lewis Institute a Sigma Xi club composed of faculty members. With the merger of the two schools into the greater Illinois Institute of Technology the two groups combined their efforts. The merger of the two schools helped greatly in promoting favorable recognition from the society since one of its prime prerequisites is that the proposed institution shall have at least six distinct science departments. The national society studied carefully such items as salaries, teaching schedules, fundamental research facilities, libraries, endowment, equipment, financial condition, number of graduate degrees granted, amount of research work, and number of research publications. The expansion of research and research facilities was so rapid that a continual revision of information and data was required. Finally in the spring of last year the national society sent a committee to inspect research facilities and determine the attitude of the Institute toward research. Having received a favorable report, the national executive council authorized the local group, then under the leadership of Arthur Goldsmith, to prepare a formal printed petition. This was presented to The Society of Sigma Xi at the national convention in December, 1941. The convention voted to grant a charter to Illinois Institute of Technology.

The local chapter was formally installed on March 25, at the Electric Club by the national president, Dr. R. A. Gortner of the University of Minnesota, and the national secretary, Dr. G. A. Baitsell of Yale University, in the presence of charter members and delegates from neighboring chapters. Seventy-four faculty members elected to the society at other institutions constituted the charter roll. At that meeting the following men were elected to office:

President—R. Oldenburger

Vice-President—D. P. Boder

Secretary—G. E. Ziegler

Treasurer—H. J. McDonald

After the installation a dinner was given in honor of the national officers at which Dr. H. A. Bethe of Cornell University delivered his national Sigma Xi lecture. His subject was "The Energy Production in the Sun and Stars."

In conformance with the national constitution, the by-laws of the local chapter allow for three grades of membership. To be eligible for full membership the candidate must have completed "original research of the standard required for publication in the accepted journals of pure or applied science." Associate members must have actively engaged in research of quality required for a master's degree or have shown exceptional promise of research ability. Graduates of the Institute who have fulfilled the qualifications for active members may be elected as alumni members.

The faculty, officials, and graduates of Illinois Institute of Technology, may well feel proud that their institution has been granted a chapter of such a famous organization as Sigma Xi. Let us hope however, that this recognition is not only a reward for past performance but even more a challenge for the future.

CLARK CRAWFORD.

1942 ILLINOIS TECH RELAYS

If keen competition makes a track meet, then the fourteenth annual Illinois Tech Relay Games, held on Saturday, March 14, at the University of Chicago Fieldhouse, were a success, for never has any track meet been more closely contested.

The college championship of the Relays was decided by a scant three-tenths of a point, and the winner of the university championship was determined by the final event of the Relays program, the university one-mile relay.

In both divisions, new champions were crowned, for a home-town school, Loyola, ended Michigan Normal's three-year domination of the college class by edging the Hurons 38 to 37.7. And Michigan State won the university crown in a three-way fight that saw the defending champion, Wisconsin, drop to third behind both Michigan State and Marquette. Scores were Michigan State, 47; Marquette, 42½; and Wisconsin, 41½.

The Spartans won the title—and the first university championship trophy ever given at the Tech Relays—when they came in second in the university one-mile relay. For prior to this event, the top three university teams had all been grouped within a range of two and one-half points, and the championship waited for the one which could top the others in the relay.

Michigan State did, running second to Wayne in a race it did not mind losing since Marquette and Wisconsin finished third and fourth. The Spartans thus became the first official university champions of the Tech Relays, as in previous years the university championship was a mythical honor which brought only newspaper headlines. The only trophy had gone to the college champion.

At this year's Games, the committee in charge divided every event into strict college and university classes, eliminating the few open races that had been run in other years. Thereby came two champions instead of one.

Thus, if the number of events and the number of awards make a track meet, then the 1942 Tech Relays were a success. For as a result of the complete segregation of college and university competition, more events — twenty-six—were held than ever before in the Tech Relays; more individual awards — 208 — were presented; and more team trophies—six—were awarded.

One new event was added to this year's Relays program. It was the Chicago Catholic High School Relay, and seven teams competed in the event, with St. Ignatius winning in the time of 1:38.6, the mark at which future runners can now shoot at, for this is to be an annual event.

No special events were held at the Relays, for these were Relays without "name" stars. They were strictly for the colleges and universities of the midwest, and thirty-six of them—twenty-six colleges and ten universities—took advantage of the opportunity.

But if names make a track meet, then the most recent edition of the Games was a success, for 324 names are listed on the roll of men who actually competed in the games. And these 324 represent the largest number of men ever to compete in the Games—in 1941, there were 313 men who actually competed in the Relays.

Biggest names in the meet were in the university shot-put, where Big Six, Big Ten, Central Collegiate and other champions competed against each other. Big Six champion, Elmer Aussieker of Missouri, the first entry his school has ever sent to the Relays, won the event.

James Fieweger was the big name from the standpoint of the Relays alone. Only man to win two events, the 70-yard low hurdles and the 70-yard high hurdles, he had a more than successful day, for he always felt the tape break across his chest, winning six consecutive races, two qualifying heats and the finals in both hurdles races.

Former important names in the Tech Relays—the five college champions and the one university champion back to defend their titles—found the going tough against the unknowns. Lew Taylor, two-time winner of the college sprint, failed even to qualify for the finals.

The only title successfully defended was the college pole-vault, when Harold Stein of Michigan Normal and Jack Preston of North Central once again tied for first place and earned co-championship. This year, however, they tied at 12 feet 6 inches, whereas last year they went 13 feet to win the event.

Their failure to reach the expected height cast no gloom on the Games, for in the university pole-vault the fans got their biggest thrill of the evening. Here Wisconsin's Bill Williams easily walked away with the championship, then failed in his three efforts at a new Tech Relays' record, 14 feet ⅝ inch, and finally on a fourth, and thus unofficial, try soared easily over the record height for the highest vault of his life—and while he got no record, the crowd got a real thrill.

Still, if records make a track meet, then the 1942 Tech Relays were a success, for three new records, including an American indoor record, were set. All three new records were in relay events.

Michigan State topped the record setters when its quartet in the sprint medley relay, Dale Kaulitz, Hugh Davis, Robert McCarthy and William Scott, did the distance in 3:31.6 to top the former Tech Relays and American indoor record of 3:31.9 set by Illinois in 1938.

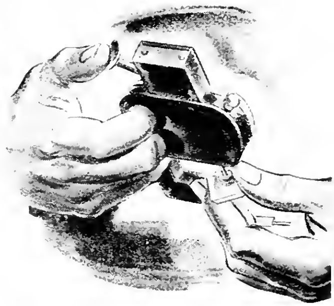
In the junior-college sprint-medley relay, Wilson set a new record of 3:43.3, eclipsing its own record of 3:44.6 made in 1940.

DuSable High School's half-mile relay team completed the record-breaking performances when it knocked nearly a full second off Tilden's former record. The DuSable quartet did the half mile in 1:34.6 as compared with the old record of 1:35.4.

If—but in reality there were no ifs because it was evident to the more than 1,000 track enthusiasts who came to the fourteenth annual Illinois Tech Relay Games that Chicago's oldest track and field classic was, as usual, a success.

"The next number will be free with 6 box tops, followed by occasional showers"

Doubletalk? No, it's how radio would sound if stations couldn't be kept on their assigned frequencies. The problem was licked once and for all when engineers discovered how to regulate radio frequencies with a tiny disc of quartz crystal, the thickness of which governs the length of the waves. Precision cutting, grinding and finishing of the quartz, a process Carborundum helped pioneer, makes today's accurate control possible.



No larger than a thumb nail, only about 1/16th inch thick, these oscillators must be finished to limits as close as 1/100th the diameter of a hair. With the aid of Carborundum Brand Abrasive Grains and Powders, the discs are made with optically flat and parallel surfaces, and thickness so accurate it must be measured in terms of light wave length.

In the development of many modern aids to living, abrasives have played a vital part. And Carborundum skill and knowledge have made much of this progress possible. These facilities will be at your disposal no matter what industry you go into. The Carborundum Company, Niagara Falls, New York.

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THE BOOK SHELF

Electrical Illumination, by John O. Kraehenbuehl. John Wiley and Sons Inc. New York. 1942.

This book is quite different from any other on this subject, having been designed for the use of architects, architectural engineers, consulting architects, and electrical engineers. It is also well adapted to the use of electrical engineering students and is almost unique because no mathematics beyond algebra and simple trigonometry appears in the text. In glancing through the book it is indeed rather difficult to find any formulas involving even the simplest trigonometric functions. The material and all the formulas should be readily understood by sophomore engineering or architectural students and even by others who have little knowledge of mathematical theory.

Despite the limited use of mathematical expressions, the book is highly comprehensive and covers the subject in such a manner as to be highly useful in practice. As stated in the preface, considerably more space is given to flood lighting and novelty lighting than is generally available in a single volume.

Considerable space is allotted to wiring for adequate illumination, and this is also rather unusual in a book on the subject of illumination. All will admit, however, that in this age of higher illumination levels, the wiring problem is a very important one.

The point of view of the architect is covered briefly in the first chapter with respect to visibility, beauty, eye comfort, atmosphere, and other subjective and physiological aspects of lighting. These subjects receive further attention in Chapter 3, which is entirely devoted to the psychology and physiology of illumination. Chapter 2 is allotted the objective side of the subject and covers the nature of light and describes some of the instruments used in the measurement of illumination values.

In the early part of the book a short chapter is devoted to color and shadow. Here such subjects as production and mixing of lights, color sensations, color blindness, and wave lengths of luminous radiations are discussed. Objective color specifications of the International Commission on Illumination are here discussed with charts and an extensive table of color analysis.

Then follow chapters on distribution curves and their uses in calculating illumination using the point by point method. Asymmetric distribution curves are treated by lumen distribution diagrams. Electrical incandescent and gaseous light-sources are given space in Chapter 6, and tables and sets of graphs are included to assist in making calculations. The next chapter is allotted to the control of light given out by these light sources. This covers various types of shades, reflectors and glassware. Materials of different kinds and shapes are discussed, as well as the methods by which they may be used to control the distribution of light. At this point, room indexes and utilization factors are tabulated for rooms of many dimensions and various reflection factors for walls and ceilings. The book makes use of utilization factors rather than coefficients of utilization which are commonly given in books on the subject of illumination. The use of coefficients of utilization involves a minimum amount of work in making lighting calculations and is usually sufficiently accurate for illumination calculations which, at best, involve some guess-work.

Chapter 8 is on general design of illumination and is accompanied by many examples with some unusual designs. Chapter 9 covers many luminous architectural elements such as glass blocks, columns, towers, and the like.

As stated above, flood lighting and novelty lighting have been given more attention than is usually allotted these subjects. In novelty lighting such subjects as ultra-violet luminescence, fluorescence, phosphorescence, ultra-violet sources, and polarized light are studied. Fountains, fluorescent paints, and all sorts of shapes and patterns are given some attention.

Maintenance, economics, and automatic control are discussed in considerable detail. These subjects are not as a rule given serious thought in text books on the subject of illumination.

The last chapter in the book, covering some fifty pages, is allotted to the subject of wiring for light and power. Codes and regulations are first taken up and, later, system layouts. Then, center-of-distribution systems (including two-wire and three-wire d.c., or single-phase a.c., three-wire three-phase, and four-wire three-phase) are covered in considerable detail. Selection of wire sizes to comply with the National Electrical Code, and also to supply adequate voltage delivery and to provide for future expansion have been given much thought and do not appear to follow a stereotyped method of procedure. Many tables are given in the text to facilitate calculations.

The book contains problems at the end of each chapter which illustrate all the principles covered in the chapter. The solution of these problems will greatly assist the student in understanding the text.

Extensive bibliographies are also given at the ends of the chapters for the benefit of those who wish to make further study of the subject.

Many features not given elsewhere are included and altogether the book is an admirable one for the practical study of illumination. The fact that it does not follow the beaten path, and the unquestioned authority of the author should make it one of the most popular text-books of the year.

The final chapters of the book are devoted to the design and performance of flood-lighting and street-lighting systems. The flood-lighting descriptions are mostly confined to building exteriors and recreational lighting. The chapter on street lighting covers the subject in the conventional manner, giving tables of desirable illumination levels, on streets carrying various types of traffic. The different elements recognized as entering into street lighting discussions are treated briefly. No specific street-lighting units are discussed and no street-lighting electric circuits are covered.

Many problems are given at the ends of the various chapters throughout the book to illustrate the principles discussed. It appears to be an admirable text book for junior and senior electrical engineers. There are numerous references at the ends of each chapter which would be invaluable for students who wish to make a further study of the subject.

F. A. Rogers

Welding, by A. C. Davies. Cambridge: at the University Press, New York: Macmillan Co.

In the present crisis, use of the welding process has been rapidly extended to many new fields. Applications in aircraft and tank construction, ordnance, shipbuilding, machine construction, etc., are becoming more common.

One of the bottlenecks, of course, is to be found in the shortage of skilled welding operators. This deficiency exists now and may continue for some time as production expands. Many operators will undoubtedly be called into the armed services.

As would be expected, hundreds of welding schools have mushroomed throughout the country in past years, and in addition many of the larger

The pipe that can't keep a secret...

LEFT: *PYREX Pipe Lines—from 1" to 4" in diameter—are hung much like other types of piping. This picture shows the use of straight lengths, an "L", and two "T's".*

ABOVE: *This close-up of 4" PYREX Piping shows the parts used in a joint: metal flanges, asbestos inserts, and a gasket.*

THIS ginger ale maker is as finicky as a New England housewife. (Probably why his ginger ale is an Eastern best-seller.)

"I want pipe I can see through", he said, "so I know it's clean. Pipe that can't alter the flavor of my product any more than the glass bottles it is sold in. Darn it, I want glass pipe!"

Glass pipe lines, made by Corning, are a familiar sight in food, beverage, and chemical plants . . . paper mills, refineries, explosives factories . . . drug, medicine, and cosmetic plants . . . in short, wherever product purity is vital.

Highly resistant to corrosion attack, Corning's PYREX Piping eliminates this cause of contamination. Transparent, it keeps no secrets . . . a glance tells of flow, cleanliness, color, sedimentation. And freedom from pitting and scaling means long life for these pipe lines, with low maintenance costs.

Important? Yes. For in today's urgent program there's no place for impure products, production stoppage, high maintenance costs, or wasted materials. And in many instances, glass has proved it can outperform metals, do an essential job better and at a lower cost.

To the engineer, this glass piping is important as an example of the many-sidedness of glass in industry and of Corning research in glass . . . research that takes in its stride such divergent tasks as the making of a tiny chemical-resistant glass spring, smaller than your thumb, or the casting of the world's largest telescope mirror, a giant one-piece disc 20 tons in weight. Today more than ever Corning is headquarters for research in glass. Industrial Division, Corning Glass Works, Corning, New York.

CORNING
means
Research in Glass

plants have established their own training programs.

In the same period a large number of technical books has appeared, especially in the field of welding. Some have been manuals for the training of operators. Others have been meant for the engineer, dealing with problems of design and metallurgy.

The book by A. C. Davies is a British publication intended for the reader in training or already engaged as a welding operator. It is unusual among such texts in that it makes a prodigious effort to supply the welder with a theoretical understanding of the process. Most training manuals are satisfied with outlining a series of shop exercises. They lay down certain rules to be followed and make little effort to explain the whys and wherefores.

Mr. Davies builds up the necessary theoretical background very carefully. The development leads, point by point, through the fields of chemistry, physics, metallurgy, and electricity. Absolutely no previous knowledge of these subjects is assumed, even the simplest concepts being treated most painstakingly. Before describing the effects of heat on metals he devotes several pages to such concepts as temperature, heat, and heat transfer. Before dealing with the response of metals to heat in the welding operation, he introduces many concepts which to the average reader are entirely new—to mention a few: stress-strain curves, elasticity, and principles of metallography.

The development from fundamentals is done in a very honest, thorough way—not in the manner of "popularized science." After the fundamentals have been laid, the development proceeds to higher levels, reaching the plane of college courses.

The book runs to over 400 pages and is well illustrated, containing some 328 figures to supplement the text.

In addition to the theoretical treatment, somewhat less than one-half of the book is devoted to instruction in the practice of arc welding, gas welding, and flame cutting. This portion corresponds to the material generally encountered in instruction manuals.

There is a chapter on automatic arc and resistance welding and another on the inspection and testing of welds. In conclusion, the reader is given brief instructions in blueprint reading. This latter, in contrast to the rest of the book, is rather inadequate. The standard welding symbols widely used in the United States are not mentioned.

How is such a book to be evaluated? It must be said that Mr. Davies has done an excellent job in presenting an all-round treatment of the theory and practice of welding. But who is going to find the book useful?

Owners and employees of small welding shops and garages, where general repair work predominates, will certainly find it valuable for they must have the broadest possible knowledge.

As for experienced welders in general, the book can be very useful. It can help them to perfect and better understand their work.

As for new welders, the demand today is for the training of specialized production workers in as short a time as possible. It is not only unnecessary but probably undesirable that trainees attempt such a broad survey. What is needed is very concentrated instruction. If men are destined to arc weld half-inch plate in a shipyard, they should receive intensive training in this one endeavor and should not devote time to other processes. It is all too common for a man who has spent a long period in a general welding course to be unable to pass the specialized test when he reaches the shipyard.

A fourth potential user might be the engineering school or technical high school. For those desiring a "shop course," the text should do very well. Progressive engineering schools, however, are more interested in applications of welding and welded design. The book is not intended to deal with these aspects.

It can be said then, that as a general survey of the theory and practice of welding, Mr. Davies' book is excellent. It cannot, however, supplant many other types of more specialized instruction.

For the benefit of those familiar with English practice, it should be mentioned that, as is stated in the preface, the book is intended to prepare the reader for the City and Guilds of London examinations in welding. The reviewer is not familiar with these standards but apparently they are qualification tests requiring considerable theoretical as well as practical knowledge.

A. E. Flanigan

THE SCHOOLMASTER

He ascended from Arrhenius, Ostwald, and Van't Hoff, as the last of a dynasty which based their investigations on thermodynamics, osmotic pressure, and ionic theory.

The reference is to Walter Nernst. The quotation is from an article by Albert Einstein, in *The Scientific Monthly* for February, 1942.

Ascended? Or descended? Doesn't Einstein know the difference between up and down?

We must suppose that the great physicist knows the difference between positive and negative, between climbing up and slipping down, between ascent and descent. He said what he meant, and his choice of word is stimulating and satisfying. Our great men, and we who are ordinary people, should have as our starting plane the level which was reached by our forebears. We have a foundation. A structure does not descend from its foundation. Our ordinary figure of speech, using "descended" where Einstein said "ascended," would have been repugnant to the man who developed the theory of relativity.

The schoolmaster has been thinking in terms of the sciences, in terms of knowledge rather than ethics, in terms of the intellect rather than behavior. We who read this have information that was not available to Aristotle, knowledge of natural laws which were not known to Galileo or Newton. We have at our disposal the accumulated product of the workers of the past. What we know, what we can build, is more than they knew, and more than they could build. It is not conceit which tells us that in mathematics, physics, chemistry, and mechanics we have risen above them; this is not because of our greater ability but because we have been able to start with a great heritage.

But let's come down out of our ivory tower. We are schoolmasters, scientists, engineers. We are also men, citizens of a great nation, inhabitants of a distressful world. Can we speak of an ascent when our generation is engaged in a war which is the first in history to include every continent and every ocean? In ethics, in behavior, in the actual doings which are now the main concern of all mankind, in the waging of a war which passes all of our earlier imaginings, in the prostitution of our accumulated knowledge and our elaborately evolved civilization to the basest uses, have we risen? Or have we been debased? The answer speaks for itself. We

(Turn to page 52)

COLOR FOR RUBIES . . .
BACKBONE FOR STEEL!

Chromium, the element that imparts precious color to rubies, imparts something more precious to steel. It gives steel incredible hardness and resistance to heat and corrosion. It makes steel strong, yet ductile and shock-resistant.

Chromium is the key that has opened — and is still opening — great new fields of application for steel. Without chromium, the whole wonderful series of *stainless steels* would not have been possible. From tarnish-free tableware to corrosion-resistant chemical equipment . . . from strong, lightweight truck bodies to streamlined trains and airplanes . . . from heat-defiant boiler tubes to high-temperature steam turbines . . . chromium has made possible a *steel* with properties of the *noble metals.*

But the stainless steels are only one great contribution of chromium. This element has also helped to provide hard, shock-resistant armor plate and armor-piercing projectiles; long-wearing engine valves; strong, tough gears, tools, ball bearings, car trucks, shafts, springs, and dies; and hundreds of other improved articles.

We do not make steel of any kind. But for over 35 years, we have made ferro-alloys and alloying metals used in steel-making. Among these are chromium, silicon, manganese, vanadium, tungsten, zirconium, columbium, and calcium.

It was our research and development that made the low-carbon grades of ferro-chromium available commercially. Without these, production of a majority of the stainless steels would have been impracticable. Inquiries about stainless and other alloy steels — their manufacture, fabrication, and use — are cordially invited.

The progress made by Electro Metallurgical Company in the manufacture and use of ferro-alloys and in the development of alloy steels has been greatly facilitated by metallurgical research in the laboratories of Electro Metallurgical Company and Union Carbide Company; by the advances in electric furnace electrodes and techniques of National Carbon Company, Inc.; and by the broad experience in the production, fabrication, and treatment of metals of Haynes Stellite Company and The Linde Air Products Company. All of these companies are Units of Union Carbide and Carbon Corporation.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

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FROM YEAR TO YEAR

A RECORD OF OUR ALUMNI AROUND THE WORLD

MAN OF THE MONTH

The *Engineer* is pleased to present as the nominee for the Man of the Month Clarence Winfield Farrier, Arch., '16, who is chief of the chemists and drugs section of the Price Division, Price Administration, Executive Office of the President, Office of Emergency Management.

Farrier was born in Tipton, Iowa, April 28, 1893, and is of Scotch-Irish and Dutch-German descent, his forebears having come to the United States more than three generations ago. After attending primary, intermediate and high schools in Tipton, he entered Armour Institute of Technology, from which he was graduated in 1916 in the Department of Architecture.

After graduation he was employed by the Northwestern Terra Cotta Company as layout man and detailer. He was later construction superintendent for Howard Van Doren Shaw, architect, of Chicago.

On May 14, 1917, Farrier entered the first Officers' Training Camp at Fort Sheridan, Illinois. He was commissioned second lieutenant in the Quartermaster Corps, and assigned to camp maintenance and construction work. He was honorably discharged with the rank of first lieutenant in September, 1919.

Farrier then entered the employ of the City of Chicago as engineer for the Chicago Plan Commission and in 1921 did similar work for the Chicago Zoning Commission. In 1924 he entered private practice as an architect, designing industrial plants, commercial buildings, apartments and residences.

From 1924 to 1929 he was associated with the firm of Bennett, Parsons and Frost, consulting architects. While with this firm, he was engaged in work on the Chicago Plan, completing studies and surveys incident to this important project. He also

FARRIER

assisted in developing a city plan for Pasadena, California, as well as the plans for the George Rogers Clark Memorial, Vincennes, Indiana; Clarence Buckingham Memorial Fountain, Chicago; Capitol grounds extension, Washington, D. C.; and A Century of Progress.

As an additional activity Farrier spent the years from 1924 to 1928 as technical advisor for the Chicago Zoning Board of Appeals. In 1929 he joined the staff of A Century of Progress, and became progressively assistant director of works, assistant director of operations, and assistant general manager. In these positions he was in charge of design and construction work on the buildings and grounds of the Chicago World's Fair. He was directly responsible for surveys, materials, and methods relative to costs of construction. His was a job in which human relations were extremely important, for he carried on all negotiations with labor unions, and also organized the guide force, police force, fire department, public address system, operating forces of buildings, shows, rides, and waste disposal.

At the close of the World's Fair in 1934, Farrier became assistant coordinator, Tennessee Valley Authority, at Knoxville, Tennessee. He was engaged in coordinating the work of the regional divisions of forestry, agriculture, agricultural industries, and land planning and housing, including the general engineering and geology divisions.

Under Farrier's direction approximately 22,000 people were removed from the area to be flooded, and were relocated in seven construction towns. In addition to managing 150,000 acres of marginal reservoir lands, he managed the seven towns including their communication operations. He resigned from T.V.A. in January, 1937, to accept the position of television coordinator with the National Broadcasting Company, New York City. In this position he pioneered in the study of television, exploring its possibilities as a program medium and as a business venture, and investigated the legal, commercial, and program aspects of production and public relations. He left the National Broadcasting Company in 1940 to become regional coordinator of defense housing.

Farrier has been active in several societies, having been president of the Chicago Architectural Sketch Club and successively secretary, vice-president, and president of the Chicago Chapter of the American Institute of Architects. He has had wide experience as a lecturer and has done considerable writing for professional publications in this country and abroad.

He was married in 1917 to Edna Mahon of Chicago. The Farriers have one son, John Marshall Farrier. His leisure-time activities consist of photography, metal work and carpentry. His residence is 627 North Nelson Street, Arlington, Virginia.

ARMOUR ALUMNI TO MEET

At the mid-April meeting of the board of managers of the Armour Alumni Association it was decided to continue the practice of holding the annual meeting. The Armour group has met at least once each year since World War I. This year the meeting is to be informal and will probably take the form of a smoker with a short period devoted to disposition of accumulated business and election of officers. Armour alumni located in the Chicago area will receive notice through the mail and reservations will be cleared through the Alumni Office. This meeting is to be held during the last week in May or the first week in June.

Considerable discussion was devoted to the future of the Armour Alumni Association in view of the recently organized Illinois Tech Alumni Association which embraces alumni of Armour, Lewis and Illinois Tech. The question was of such importance that the board of managers empowered President McCaffrey to call together the Armour advisory council, which is composed of all former elected officers of the Armour Alumni Association, to consider this problem. Whatever decision is reached by the advisory council will be imparted to those in attendance at the annual meeting and perhaps a final plan will evolve from the resulting discussion.

In the organization of the Illinois Tech alumni group the Armour board of managers has given valuable aid and is ready to cooperate in any way possible. However, until the Illinois Tech group is well established it is probable that the formal organization of the Armour Alumni Association will continue to exist.

NOMINATIONS FOR OFFICERS OF THE ARMOUR ALUMNI ASSOCIATION

Article X, Section 1, of the Constitution of the Armour Alumni Association, reads as follows:

Before April fifteenth of each year in which an election is to be held, the Board of Managers shall appoint a committee on nominations, of five active members. Two members of this committee shall be selected from the Board of Managers and no other members of the committee shall be members of the Board of Managers. No two members of the committee shall be from the same class.

This committee shall prepare and transmit to the secretary-treasurer not later than the fifteenth of May, a written list of nominations for the various offices to be filled. The secretary-treasurer shall include this list, together with a statement that an election is to be held, in the announcement of the annual banquet for that year.

Pursuant to this article, the following names are placed in nomination:

FOR PRESIDENT
(Two-Year Term)
Claude Albert Knuepfer, C. E., '15.

FOR VICE-PRESIDENT
(Two-Year Term)
Arthur Henry Jens, F.P.E., '31.

FOR SEC'Y-TREASURER
(Two-Year Term)
George Henry Von Gehr, E.E., '28.

FOR BOARD OF MANAGERS
(Four-Year Term)

Representing Classes 1897-1901
William Fargo Sims, E.E., '97.

Representing Classes 1907-1911
Edward F. Pohlmann, Ch.E., '10.

Representing Classes 1917-1921
John Warren McCaffrey, Ch. E., '22.

Representing Classes 1927-1931
John Hommes, F.P.E., '29.

Representing Classes 1937-1941
Alexander Paul Schreiber, Ch.E., '37.

Other nominations may be made from the floor, at the time of the election, at the annual banquet. Election will be conducted in accordance with Article XI, Section 1, of the Constitution, which reads as follows:

Voting shall be from the floor at the annual banquet. The secretary-treasurer will supply ballots to the active members present. A plurality of votes cast shall elect. The president shall appoint a committee of three tellers of election who together with the secretary-treasurer of the Alumni Association will determine the ballot. This committee shall report to the president who shall in turn announce the results of the election before the adjournment of that meeting.

Respectfully submitted:
Louis J. Byrne, M.E., '04, Chairman
James C. Peebles, E.E., '04
Robert M. Krause, M.E., '31
Stanley M. Lind, Ch.E., '32
Frank A. Lasker, M.E., '40
Committee on Nominations.

CLAUDE ALBERT KNUEPFER, C.E., '15

The nominee for the presidency of the Armour Alumni Association is a graduate of the Civil Engineering Department with the class of 1915. Claude Albert Knuepfer is expected to take over the reins of the alumni association from the capable hands of J. Warren McCaffrey who is to continue active in Armour alumni affairs as the representative of the class group 1917-1921 on the Board of Managers.

Knuepfer is completing a term as vice president of the Association and in this position he took an active part in the creation of the Illinois Institute Alumni Association. He was a member of the Armour alumni committee to study means whereby the alumni groups of Armour, Lewis and Illinois Tech might be joined into an effective organization.

Soon after graduation from Armour, Knuepfer became superintendent and

KNUEPFER

secretary of the Automatic Screw Machine Products Company and served with this company until 1922, with time out for war service. In 1922, he founded and became president and general manager of the General Engineering Works, a position he holds to the present day. This company specializes in accurate screw-machine products and is engaged in an intensive war production program on a 24-hour basis.

In World War I, he served as a first lieutenant in the Engineer Corps and took active part in the Meuse-Argonne and St. Mihiel offensives. He spent twenty-seven months in the service, thirteen of which were with the A.E.F.

Prior to the time he was elected to the vice presidency of the Armour Alumni Association, he served a two-year term on the Board of Managers, from 1938 to 1940. He was a member of the Board of Managers from 1920 to 1922 and from 1927 to 1930.

While in college "String," as he was affectionately known to his class-

mates, took part in everything that was going on at the Institute. He played varsity basketball and was elected president of his class in his senior year. He was business manager of the Cycle and editor of the Armour Engineer. A further example of his interest in Armour affairs was his contribution of $2000 to the field-house fund which is being gathered for the purpose of erecting an adequate athletic plant on the Illinois Tech campus.

From his home in River Forest, Illinois, he conducts extensive operations in the Boy Scouts of America program. He is a member of the advisory board of the National Council and also a member of the Seventh Region Council. He is president of the Thatcher Woods Council which supervises the Oak Park area. He is a member of the Oak Park Club, the River Forest American Legion Post, and the National Screw Machine Products Association, in which he is chairman of the Chicago section. He is a member of Phi Kappa Sigma.

He was married to Ella A. Parrant in 1919, and has two sons and a daughter. One son is in the American field service en route to Libya, while the other son is a student at Cornell University in the administrative and mechanical engineering department. His daughter is a junior in high school.

ARTHUR HENRY JENS, F.P.E., '31

The nominee for the position of vice president of the Armour Alumni Association is Arthur Henry Jens who entered Armour in 1927 as a scholarship student in the Department of Fire Protection Engineering. He was graduated with the class of 1931 with high honors.

Jens is a Chicago product, having been born in Park Ridge, a Chicago suburb, in 1909. His primary education was secured in Chicago schools and he later was graduated with honors from Lane Technical High School. After a short stay at Crane Junior College he entered Armour.

JENS

His entire business life has been spent in the insurance field. After graduation from Armour he entered the service of the Wisconsin Inspection Bureau, which is now known as the Fire Insurance Rating Bureau. Upon completion of his contractual obligations with the fire insurance scholarship committee he returned to Chicago and entered the University of Chicago Law School and later the John Marshall Law School. During this time he was an underwriter in a Chicago insurance office, and six years ago he joined the western department staff of the Springfield Fire and Marine Insurance Company as engineer. Recently he was made chief engineer of the Springfield. He is responsible for all engineering activities of the Springfield Group in the western field, which embraces eighteen states.

While at the Institute, Jens had his hands in almost everything that was under student control. He was a member, and later president, of Sphinx, honorary literary society, and a member of Honor A, letterman's society. He ran in varsity track for three years, and some of the records that he established in the sprints still stand on the books. He was a member of the only Armour track team to win the Armour Relays team trophy. He was publicity manager of the A.T.A.A. and was vice president of the Armour Fire Protection Engineering Society. He was named honor award senior number one.

His activities in the literary field cover all of the Institute's publications. Successively he was assistant editor, associate editor and editor-in-chief of the Armour Cycle. He was on the original staff of the Armour Tech News and was sports editor, columnist, managing editor, and a member of the managing board of this publication. He has been alumni editor of the Engineer and was recently made associate editor. He served for several years on the advisory board of the Engineer. Outside literary work includes editorship of the publication of the Milwaukee Y.M.C.A. in 1932, and the Chicago Section Bulletin of the American Society of Mechanical Engineers.

The professional degree of Fire Protection Engineer was awarded to Jens by Armour Institute in 1934 for his thesis covering the organization and functions of a rating bureau. He is a licensed professional engineer.

He is a member of the Western Society of Engineers and of the American Society of Mechanical Engineers. He has been a member of the Chicago Section executive committee of the A.S.M.E. for five years, and has been chairman of junior engineers' activities and program chairman. He is A.S.M.E. representative to the Chicago Management Council.

Ever since graduation Jens has taken active part in the operation of the Alumni Association. In 1931 he was co-founder of the Milwaukee-Armour group and was chairman of the Armour Plan campaign in 1932 for the Milwaukee area. In 1938 he was a vice chairman and was instrumental in developing the annual gift program. He was elected to the Board of Managers in 1938 and has been chairman of the important Alumni Relations Committee. He was chairman of the tenth reunion of his class in 1941.

Jens is unmarried and lives with his parents at 1638 Juneway Terrace, Chicago. His interests outside of the insurance field are in the activities of the engineering societies, especially in the management divisions of these groups. He swings a determined golf club but has yet to get into the eighties. He may be seen frequently on the bridle paths in Chicago's Forest Preserves but is strictly an amateur when in the saddle. He is a member of Theta Xi fraternity and is an alumni adviser to the Armour Chapter.

GEORGE HENRY VON GEHR, E.E., '28

One of the most important offices in the Armour alumni organization is that of secretary-treasurer. All of the funds of the Association in addition to the alumni student loan fund are placed in his custody and administered by him under the direction of the alumni Board of Managers. To fill this position, the nominating committee has selected George Henry Von Gehr who was graduated with the class of 1928 in the Electrical Engineering Department.

For the past four years, William N. Setterberg, Arch., '29, has conducted the affairs of the secretary-treasurer's

VON GEHR

office with great distinction. He undoubtedly would again have been the nominee for this position except that he has left Chicago for a position in the U. S. Engineer Office in Galveston, Texas.

Von Gehr is a member of the firm of Langner, Parry, Card and Langner, who specialize almost entirely in international patent and trademark work. He is in charge of several very important departments in the Chicago office and frequently does consulting work in this field. He has made a study of foreign patent laws and his opinion on any phase of this subject is highly regarded.

While at the Institute, George was active in extra-curricular work to such an extent that he was named honor award senior number seven. He was a member of Tau Beta Pi, national honorary engineering fraternity, and of Eta Kappa Nu, honorary electrical engineering fraternity. He was president of the honorary fraternity council in his senior year and was a departmental editor on the Armour Engineer staff. He took active part in the Press Club and in the Armour section of the American Institute of Electrical Engineers.

After graduation from Armour in 1928 he became associated with the law firm of which he is now a partner. At the same time, he entered the John Marshall Law School and was graduated in 1931 with the degree of Doctor of Jurisprudence. In 1933, he was admitted to practice before the Illinois Bar, the United States Patent Office and the United States Federal Courts. He has taken graduate work at the University of Chicago and at the Institute.

He has written numerous papers largely concerned with patent protection in foreign countries, and has talked on many occasions to engineering societies and other groups on this subject.

George is married and with his wife, daughter and very young son makes his home in Glencoe, Illinois. His spare time during the winter is spent on the badminton courts at the Skokie Country Club, while in the summer time he may be found on the tennis courts at the same club. His ability in these sports may be gaged by his usual high standing in his club's championship tournaments. His wife, too, is an excellent athlete and has presented severe competition on many occasions.

In Armour affairs George has always been ready with a helping hand. He took part in the Armour Plan program of 1932 and reached one of the highest quotas of any of the class groups. He assisted in establishing the annual gift program inaugurated in 1938. His collegiate fraternity, Sigma Kappa Delta was consolidated with Theta Xi and he was one of the guiding spirits in this very difficult task.

Von Gehr is a member of the American Bar Association, the Chicago Bar Association and the Chicago Patent Law Association. He is a member of the Theta Xi Club of Chicago. He has been a leader in the Community Fund Drive in Glencoe and has been active in young people's work at the Fourth Presbyterian Church of Chicago.

NEW YORK ALUMNI MEETING

Illinois Tech alumni of the New York area met March 11, 1942, at the Chemists' Club in New York City. The fifty-two alumni who attended were guests of C. Donald Dallas, Ac., '02, and Robert I. Wishnick, Ch. E., '14.

Mr. Dallas is president of the Revere Copper and Brass Company, Inc. He was elected president of the New York Illinois Tech Club. Albert D. Gilmore, M. E., '01, superintendent of power, New York Central R. R., was elected vice president. Paul K. Brown, M. E., '13, advertising production manager, McFadden Publications, Inc., was elected secretary of the club. Robert I. Wishnick, president, Wishnick-Tumpeer, Inc., was elected chairman of alumni effort.

President Heald, Bernard P. Tayler, and Harold A. Vagtborg were speakers at the dinner. Eleven men, each representing a professional engineering periodical, were guests.

Alumni present were:

Wilbur H. Armacost, M. E., '16; Louis Bisno, Ch. E., '16; George G. Blair, F. P. E., '23; Emory P. Boynton, Ch. E., '30; John W. Brierley, Ch. E., '41; Janet H. Buehring, Lewis, '35; Donald E. Cable, Ch. E., '18; Franklin E. Christensen, Arch., '30; Ronald B. Clark, C. E., '12.

Dorothy Dyrenforth-Luman, Ac., '09; Walter Ehrlich, C. E., '14; Leonard E. Erlandson, Ch. E., '22; Charles R. Ferguson, M. E., '22; George M. Fritze, M. E., '17; Albert D. Gilmore, M. E., '01; Carl A. Grasse, F. P. E., '16; William B. Graupner, E. E, '37; Ellsworth J. Hollopeter, M. E., '25; George Parker Hanna, Jr., C. E., '40; Edwin J. Hiller, E. E., '04; L. W. Holmboe, E. E., '14; William D. Jackson, C. E., '33; Leslie J. Kane, Ch. E., '29; Leroy A. Kaye, M. E., '23; Lois S. Kellogg, Lewis, '13; Henry F. Klemm, Ch. E., '20; August J. Kreuzkamp, Jr., M. E., '33; Irving B. Lueth, E. E., '28; S. P. McDaniels, M. E., '17; Harry E. Moyses, E. E., '10.

Lloyd Mellor, Arch., '17; James W. Murray, M. E., '41; John Leo Nagle, C. E., '15; Paul E. Nelson, M. E., '26; Leonard Peterson, F. P. E., '16; Louis H. Pfohl, C. E., '24; Herbert W. Puschel, F. P. E., '18; Mark A. Rumely, M. E., '22; William G. Rundell, M. E., '36; Irwin H. Schram, C. E., '08; Seymour Schwartz, Ch. E., '41; Robert W. Scott, M. E., '40; Frank D. Sheibley, E. E., '97; Harrison J. Slaker, E. E., '98; Helen Smith, Lewis, '11; Jesse K. Stahl, M. E., '25; Roy Stewart, Ch. E., '07; Swanson, Frank A., E. E., '14; Robert R. Tufts, Arch., '35; Hubert E. Willson, M. E., 15; Grover H. Wilsey, C. E., '08.

CINCINNATI GROUP MEETS

Cincinnati Illinois Tech alumni held their first meeting on Mar. 23, 1942, at the Hotel Gibson in Cincinnati. Alumni sponsors were West Shell and John T. Even, F.P.E.,'28. John J. Schommer, former alumni president, explained the work of the Placement Office in supplying engineers for governmental bureaus and for business and industry. He also spoke of the tremendous efforts of the Institute in training defense workers for defense industries.

Arthur E. Wright, executive secretary of the Alumni Association, outlined the activities of the Armour board of managers and the Lewis board of governors in the creation of the Alumni Association of Illinois Institute.

The following permanent officers were elected at the meeting: West Shell, president; Charles N. Mullican, F.P.E.,'27, vice president; Walter H. Alexander, F.P.E.,'27, secretary-treasurer.

Alumni present included:

Black, Sydney D., E.E.,'40; Cox, Harold E.; Eng, Gan, Ch.E.,'38; Freilinger, Otto P., F.P.E.,'35; Greenfield, Theodore, Ch.E.,'24; Hammer, Hoyt M., F.P.E.,'26; Henriksen, Paul F., M.E.,'39; Kann, William H., C.E., '14; Miran, Walter M., F.P.E.,'31; Moss, Charles M., E.E.,'02; Mueller, John S., E.E.,'03; Wilson, Melville M., Ch.E.,'19.

WASHINGTON, D. C., GROUP MEETS MARCH 24TH

Illinois Tech alumni in Washington met for the third time on March 24 at the Cosmos Club. Dudley F. Holtman, C.E.,'12, who had been appointed acting chairman, was elected to the presidency. Maynard P. Venema, Ch.E.,'32, was elected vice president, and Fay M. Findley, Lewis,'36, who had been acting secretary, was elected permanent secretary-treasurer. John J. Schommer and Arthur E. Wright were guest speakers. A committee was appointed to plan a dinner dance, picnic, and other activities for the Washington club during the coming months.

1897

Rice, Ralph Herbert, E.E., is principal assistant engineer, in charge of all engineering work, for the board of supervising engineers, Chicago Traction Commission, 231 S. La Salle Street, Chicago. His home is at 1007 13th Street, Wilmette, Illinois.

1898

Rising, Philip Arthur, is employed as western division manager and director in Chicago for Charles Pfizer & Company, Inc., of New York. His business address is 444 W. Grand Avenue, Chicago, and he resides at 2311 Lincoln Street, Evanston, Illinois.

1901

Johnck, Frederick, is an architect with Johnck & Ehmann, 104 S. Michigan Avenue, Chicago. He resides at 4070 Grove Avenue, Western Springs, Illinois.

1902

Charles, Walter T., Ch.E., is practicing as an architect at 77 W. Washington Street, Chicago. He resides at 57 E. Elm Street, Chicago.

Hulla, Adelaide Eunice, Arch., resides at 225 Clinton Avenue, Oak Park, Illinois.

1904

Prussing, Rudolph E., who is treasurer for Whiting Corporation, Harvey, Illinois, resides at 20 E. Cedar Street, Chicago.

1905

Carroll, Emil Joseph, E.E., is now serving with the United States Army engineers. His home is at 128 Linden Avenue, Glencoe, Illinois.

Emmons, Francis Asbury, is vice-president of Foote Brothers Gear & Machine Corporation, 5301 S. Western Boulevard, Chicago. He resides at 542 Meadow Road, Winnetka, Illinos.

Heine, Frederick C., E.E., who has been with Commonwealth Edison Company, Chicago, since 1905 as inspector, wiring estimator, and power salesman, retired from active service January 1, 1942. He resides at 1040 Wrightwood Avenue, Chicago.

1906

Clucas, George W., M.E., is president of Stannard Power Equipment Company, 53 W. Jackson Boulevard, Chicago. He resides at 624 Linden Avenue, Wilmette, Illinois.

Cook, Norman W., Arch., is in business for himself as an architect at 700 Webster Street, Ottawa, Illinois, and resides at the same address.

1907

Gilmore, Millard, E.E., resides at 134 S. Ridgeland Avenue, Oak Park, Illinois.

Haggander, Gustave Anton, C.E., is employed as assistant chief engineer for Chicago, Burlington & Quincy Railroad Company, 547 W. Jackson Boulevard, Chicago. He resides at 62 Malden Avenue, La Grange, Illinois.

Smith, Clarence U., M.E., is a consulting civil engineer, specializing in railroad and harbor work, and also operates a forty-acre ranch, raising olives and oranges. He may be reached at P. O. Box 953, Lindsay, California.

1908

De Lemon, Hugo R., is employed as manager for the Standard Brands, Incorporated, 1015 Independence Boulevard, Chicago. He resides at 3536 S. Western Avenue, Chicago.

Friedlander, Lawrence C., M.E., is employed as secretary by the First United Finance Corporation, 9 W. Washington Street, Chicago. His home is at 5474 Everett Avenue, Chicago.

1909

Downton, Percival G., E.E., is employed as sales engineer for The Electric Storage Battery Company, 4613 S. Western Boulevard, Chicago. He resides at 925 Ontario Street, Oak Park, Illinois.

Freund, Erwin O., is president of The Visking Corporation, 6733 W. 65th Street, Chicago. He resides at 5009 Ellis Avenue, Chicago.

Harger, Charles K., C.E., is employed as district engineer for the State of Illinois Division of Highways, 35 E. Wacker Drive, Chicago, and lives at 7207 Harvard Avenue, Chicago.

Meyer, Walter W. L., Ac., is an assistant judge in the Probate Court. He is a member of the firm of Rentner and Meyer, 160 N. La Salle Street, Chicago. His home is in Oak Park, Illinois.

Waldo, Alfred T., is employed as sales engineer for the Hamilton Manufacturing Company, Two Rivers, Wisconsin. He resides at 2916 Adams Street, Two Rivers, Wisconsin.

Williams, Edward H., Ac., is a fuel dealer and is located at 6117 Fourteenth Avenue, Kenosha, Wisconsin. Residence is at 6023 Eighteenth Avenue, Kenosha, Wisconsin.

1911

Dormitzer, Max R., has his own business, engaged in foreign trade, at 201 N. Wells Street, Chicago. He resides at 633 Park Drive, Kenilworth, Illinois.

1913

Braun William T., Arch., is in business for himself as an architect and resides at 515 East 89th Place, Chicago.

1914

Burnham, Clifford L., M.E., according to a recent news release, has been appointed to the Advisory Board of the Chicago Ordnance District. He is a consulting management engineer and will act as an advisor to the ammunition division of the Ordnance District.

During the first world war he was commissioned a first lieutenant in the Field Artillery and served overseas with the Fifth Artillery of the First Division. He holds a reserve commission as colonel in the Army.

1919

Wertheimer, Harry K., is a cattle salesman and partner of Rosenbaum Brothers and Company, Exchange Building, Union Stock Yards, Chicago. He is vice-president of the Chicago Live Stock Exchange. His home is at 5219 Greenwood Avenue, Chicago.

1921

Judson, Lyman D., Ch.E., was ordered to active duty in the army on January 12, 1942. He is a lieutenant colonel and is serving with the Illinois military area headquarters in Chicago. His home is at 1125 N. Elmwood Avenue, Oak Park, Illinois.

1922

Kendrick, Ralph S., E.E., may be reached at 110 Superior Street, Michigan City, Indiana.

1923

Colby, Donald C., E.E., is employed as sales engineer for The Texas Company, 3052 Archer Avenue, Chicago. He resides at 6731 Jeffery Avenue, Chicago.

Hagen, Hilding E., is employed as fire prevention engineer for Chicago Board of Underwriters, 175 W. Jackson Boulevard, Chicago. He resides at 1219 Sixteenth Street, Wilmette, Illinois.

Wilson, Edward Lawrence, is vice-president, Wyatt C. Hedrick, Inc., architects and engineers, 1005 First National Bldg., Fort Worth, Texas.

1924

Brankin, Edmund J., is employed by Monumental Life Insurance Company, 309-314 Empire Building, Pittsburgh, Pennsylvania, and lives at 1801 Fallowfield Avenue, Beechview, Pittsburgh, Pennsylvania.

Vorsheim Jr., Henry George, Ch.E., is pastor of the Westminster Presbyterian Church, Chester Avenue and 58th Street, Philadelphia, Pennsylvania, and writes:

"I appreciate the literature sent con-

ELEVATED WATER TANKS GO TO WAR

Water supply systems to supply large military camps are in many respects similar to those used in cities of the same population. A few camps are served by existing systems but the greater proportion of them have their own supply.

Like municipalities, they obtain their supply from wells, lakes or streams. Surface supplies are filtered or purified in case this is necessary, pumping stations are installed and distribution mains are laid. Furthermore, elevated steel tanks, like the one shown above at a Southern camp, are installed to meet peak demands and to provide uniform gravity pressure at all times. It was fabricated and erected by the Chicago Bridge & Iron Company.

cerning the Institute and feel that the recent merger will mean much to both institutions and greater Chicago. I am proud to be an alumnus of I.I.T. As pastor of the second largest Presbyterian Church in Philadelphia Presbytery, I have contacts with many engineers and can speak intelligently with them concerning their work as well as their spiritual problems, and often the former leads to greater helpfulness in the latter."

Reverend Mr. Vorsheim resides at 5820 Whitby Avenue, Philadelphia, Pennsylvania.

1925

Chiaro, James Edward, is employed as construction engineer for Patrick Warren Construction Company, 228 N. La Salle Street, Chicago, and lives at 5539 Van Buren Street, Chicago.

Davis, Wilfrid E., C.E., is employed as a salesman by the Kentucky Bonded Sales Company, 139 N. Clark Street, Chicago. He resides at 8135 Phillips Avenue, Chicago.

Geiger, Earl Russell, Ch.E., is quality supervisor, United States Gypsum Company, Gypsum, Ohio. His home is at 728 Monroe Street, Port Clinton, Ohio.

Stahl, Jesse K., M.E., is employed as sales manager for Roller Bearing Company of America, Trenton, New Jersey, and lives at River Road, Trenton, New Jersey.

Webb, Edward Francis, C.E., died September 9, 1941. He was one of the government engineers on the housing project at Vallejo, California, and was in charge of erection of 942 residences.

1926

Bacci, Alexander H., Arch., who is employed as architect with Sears-Roebuck and Company, Homan and Arthington Street, Chicago, writes:

In addition to my position with Sears-Roebuck and Company, I have maintained my own architectural practice for the past five years. I have designed and built some thirty to forty residences, and in the past two years have built for Sears eight community centers in all parts of the country. I should like to cooperate in any way possible in any undertakings of the Illinois Institute Alumni Association.

The Bacci residence is at 534 Roscoe Street, Chicago.

Harrington, J. Earl, Ch.E., writes that since February 1, 1942, he has been acting as expert consultant and engineering coordinator, Quartermaster General's office, War Department, Washington, D. C. Residence is at 1330 Ashland Avenue, Wilmette, Illinois.

1927

Coy, William Manchester, is schedule superintendent for the Naval Aircraft Factory, Navy Yard, Philadelphia, Pennsylvania, and resides at 2601 Parkway, Philadelphia, Pennsylvania.

Fleischer, Joseph, E.E., is a captain in the Quartermaster Corps, Seventh Quartermaster Training Regiment.

Lauer, Cyril J., F.P.E., is staff engineer for the Fireman's Fund Insurance Company, 175 W. Jackson Blvd., Chicago. He resides at 381 Alles Avenue, Des Plaines, Illinois.

Moese, Otto H., who is a lieutenant, was appointed recently as adjutant of the 472nd school squadron. He was a civil engineer before being called to duty, and is a member of the Reverve Officers' Association, the Army-Navy club of Chicago, and the American Association of Engineers.

Pederson, Marius J., passed away on March 20, 1942, at Sioux City, Iowa.

Since 1927, after the death of his father, he had been operating his father's dairy business at Sioux City, Iowa.

At the time of his attendance at the Institute he was taking the chemical engineering course.

1928

Beisber, Mathew Frank, M.E., has recently been transferred to Oakland, California as transformer sales engineer for Line Material Company, 1125 Sixth Avenue, Oakland, California. His home address is 1960 Bryant Street, Palo Alto, California.

1930

Lossman, Joseph R., F.P.E., has recently been transferred by the Oil Insurance Association in Tulsa, Oklahoma, to 175 W. Jackson Boulevard, Chicago.

Stier, Herbert E., E.E., has been promoted to the rank of captain in the United States Army and has been attached to the Chicago Ordnance District. Prior to reporting for active army service, he was office manager of the Spaulding Fiber Company, 4757 N. Ravenswood Avenue, Chicago.

1931

Iverson, Daniel J., C.E., has been transferred to the Cleveland, Ohio office of the Metal Lath Manufacturers' Association.

Rutt, Frank E., C.E., writes that he was ordered to active duty as a lieutenant, U.S.N.R., in the Bureau of Aeronautics, Washington, D. C., on January 8, 1942. At present he resides at 1520 N. Lancaster, Arlington, Virginia.

1932

Bills, George H., E.E., is located at a Quartermaster School.

Hill, George J., F.P.E., is a safety engineer, United States Naval Torpedo Station, Keyport, Washington.

Wierzbowski, Anthony E., C.E., is employed as material estimator for the Bates & Rogers Construction Company, Kingsbury, Indiana. His home is at 2430 N. Harding Avenue, Chicago.

1933

Hoffman, William C., M.E., who is a first lieutenant in the Army Air Force may be reached through Army Post Office No. 907, c/o Postmaster, New York, New York.

Johnson, Irving C., M.E., formerly of 1750 Arthur Avenue, Chicago, passed away December 9, 1941.

MacLennan, Jack L., C.E., has changed his address to 7735 South Prairie Avenue, Chicago.

Reardon, Edward P., E.E., is an electrical engineer, Zenith Radio Corporation, 6001 W. Dickens Avenue, Chicago, and lives at 505 South Highland Avenue, Lombard, Illinois.

Sademan, Elmer E., F.P.E., has been appointed special agent for Michigan by the Agricultural and Empire State Insurance Companies. For the past two years he has been traveling the Michigan territory as engineer and special agent for National Fire Insurance Co. His home address is 3327 Wiscasset Road, Dearborn, Michigan.

1935

Abrams, Bernard B., C.E., writes that he is now in the Corps of Engineers.

Koeber Jr., Henry J., has recently changed his address to R. R. 6, Box 802, Johnson Road, South Bend, Indiana.

Miller, Russell Charles, Ch.E., is an

instructor at Tuley High School, Chicago. He resides at 6452 S. Artesian Avenue, Chicago.

Siegel, Charles, Arch., resides at 1718 East 55th Street, Chicago.

1936

Alderman, Jerome C., C.E., recently received a promotion to first lieutenant, Corps of Engineers, United States Army. His home address is R.F.D. No. 1, Bensonville, Illinois.

Groves, Ralph H., Arch., is an architectural draftsman for the T.V.A., Knoxville, Tennessee. He may be reached through Box 189, Norris, Tennessee.

Ormsby, George W., E.Sc., who is industrial representative for the Standard Oil Company, 205 Janes Street, Saginaw, Michigan, lives at 2455 Military Street, Port Huron, Michigan.

Samuels, Robert P., Arch., is first lieutenant, United States Army, Quartermaster Corps. He is on duty as motor maintenance officer in charge of third echelon repair shops. His work consists of unit repair and unit replacement of parts for all tactical vehicles of the Eighth Army Corps and the Third Army.

Siegel, Arthur J., M.E., lives at 1718 East 55th Street, Chicago.

1937

Dowling, John J., E.E., is a switchboard inspector for the War Department, and lives at 104 S. Leamington Avenue, Chicago.

Hockert, Chester E., M.E., who is employed as designer and calculator, Allison Engineering Company, Speedway, Indiana, lives at 3519 Gullford, Indianapolis, Indiana.

Jaedtke, Marshall F., C.E., is an aircraft inspector for the Vega Airplane Company, Burbank, California. His residence address is 214 West Doran Street, Glendale, California.

Jost, Frederick H., F.P.E., is a private, special fourth class, and is stationed at Camp Polk, Louisiana. His home address is 618 North 22nd Street, East St. Louis, Illinois.

Winkler, Richard E., F.P.E., resides at 11864 Clifton Boulevard, Lakewood, Ohio.

1938

Beardsley, Richard F., F.P.E., is employed by North America Insurance Companies, 209 West Jackson Boulevard, Chicago.

Chitgren, William J., M.E., writes he has recently been transferred by the Remington Arms Company to the Utah Ordnance Plant. He resides at the University Club, 136 E. South Temple, Salt Lake City, Utah.

Emmerich, William Karl, E.E., has been in St. Louis, Missouri for the past two years. He has married Miss Leora Wolff of Chester, Illinois. He is employed as safety engineer for the Lumbermen's Mutual Casualty Company, 2167 Railway Exchange Building, St. Louis, Missouri. Residence is 1005 Hi Pointe Place, St. Louis, Missouri.

Heintz, William R., may be reached at P. O. Box 206, West McHenry, Illinois.

Krumbein, Jack, Ch.E., is a second lieutenant in the Chemical Warfare Service.

Kubik, Joseph Anton, Ch.E., writes he was married to Miss June Kostka of Chicago on June 7, 1941. His home address is 4155 N. Malden Avenue, Chicago. He is employed as metallurgist for the Stewart-Warner Corporation, 1800 West Diversey Parkway, Chicago.

Monson, Ronald, C.E., is employed as a structural draftsman for the Tennessee Copper Company, Copperhill, Tennessee.

JOHN O'CONNELL

O'Connell, John Francis, Jr., Ch.E., according to an official notice from the War Department was killed in action in the Philippines on December 8, 1941. He was a second lieutenant, Army Air Force. He made an outstanding record at the Institute, was a member of Alpha Chi Sigma, Honor A Society, American Institute of Chemical Engineering, and co-captain of the basketball team. O'Connell received his officer training and commission at Maxwell Field, Alabama, and was stationed in the Philippines.

He is survived by his parents, three sisters, Mary, Peggy and Geraldine, and a brother, Daniel, who is a sophomore at Armour.

Quayle, Vincent Harrison, E.E., is a communication sergeant with a cavalry section, in a tank unit. His home is 1255 N. Dearborn Street, Chicago.

Skeppstrom, Edwin J., M.E., is a development and research engineer for the Teletype Corporation, 1400 Wrightwood, Chicago. He resides at 6226 Newark Avenue, Chicago.

Stoll, Evan Lee, C.E., is a second lieutenant in the Army Air Corps. His home address is 7420 Kenwood Avenue, Chicago.

Widell, Frederick M., Ch.E., is employed as an industrial engineer by the American Steel and Wire Co., Donora, Pennsylvania. He may be reached at R. D. 1, Belle Vernon, Pennsylvania.

1939

Clark, Thomas A., M.E., who is a lieutenant, may be reached at Squadron C, Group 4, Barracks 854, Rm. 2, U. S. Army Air Force, Maxwell Field, Alabama.

Cump, Jr., Percy W., C.E., is a first lieutenant, U. S. Army.

Finnigan, Stephen P., F.P.E., is employed at the plant of General Electric, at Lynn, Massachusetts.

Gilbert, Jr., James, M.E., is employed as assistant fuel engineer by the Public Service Company of Northern Illinois. His home address is 103 Gillett Avenue, Waukegan, Illinois.

Heigh, Charles F., is minister of the Methodist Church, Glen Carbon, Illinois. His residence address is McKendree College, Lebanon, Illinois.

Jacobson, Daniel W., F.P.E., writes in part as follows: In the interest of keeping the alumni records up to date, I should like to advise that I left the Illinois Inspection Bureau, and have been engaged by the War Department, Chicago Ordnance District since February 16, as a plant protection engineer.

1940

Balis, Moorman R., M.E., is employed as a project and research engineer by the Stromberg aircraft and carburetor department of the Bendix Aviation Corporation, South Bend, Indiana. He may be reached at Box 628, R. F. D. 5, South Bend, Indiana.

Barlick, Robert F., Ch.E., is now a private, first class, in the medical department at Hammer Field, Fresno, California.

Capman, Robert L., is in the United States Army and is stationed at Fort Monmouth, New Jersey. His home is at 8229 South Green Street, Chicago.

Dahl, Walter L., F.P.E., who is junior inspector, plant protection service, United States Army Signal Corps, 1819 W. Pershing Road, Chicago, is living at 7317 Rhodes Avenue, Chicago.

Elgenson, Leonard, C.E., is a second lieutenant in the Army Air Force.

Etto, Charles R., M.E., is an assistant engineering officer in the United States Army Air Force. His home address is 2924 Greenleaf Avenue, Chicago.

Foster, Robert J., Ch.E., who is employed by the Northern Regional Research Laboratory, Peoria, Illinois, as assistant chemical engineer, resides at 912 Sibley Boulevard, Dolton, Illinois.

Frost, George E., E.E., is an engineer in the patent department of the General Electric Company, 1326 E Street, N. W., Washington, D. C. He lives at 2111 H Street, N. W., Washington, D. C. For mail: 726 N. Kenilworth Avenue, Oak Park, Illinois.

Hassell, Vernon J., F.P.E., who is an inspector for the Western Factory Insurance Association, Chicago, married Miss Zoe Brown of Chicago on September 27, 1941. Residence is 711 North Sixteenth Street, Milwaukee, Wisconsin.

Holle, Fred, M.E., may be reached at P. O. Box 1291, Diablo Heights, Canal Zone.

Hunter, Thomas A., F.P.E., who is employed as inspector by the Western Factory Insurance Association, 175 West Jackson Boulevard, Chicago, lives at 4147 North Greenview, Chicago.

Mandel, Ernest M., Arch., is a junior architect engaged in designing buildings for the United States Army Air Force, New War Department Building, 21st and Virginia, N. W., Washington, D. C. His residence address is 2111 I Street, N. W., Washington, D. C.

Shirriff, Robert G., Ch.E., who is a junior engineer with the Kimberly Clark Corporation, Niagara, Wisconsin, lives at Kimlark Inn, Niagara, Wisconsin.

Slavin, Frank E., F.P.E., has informed the Alumni Office that he recently changed his position, and is now student test engineer for General Electric Company. His first assignment is in Bridgeport, Connecticut, and his new address is 651 State Street, Y.M.C.A., Bridgeport, Connecticut.

WILLIAM YEAGER

YEAGER, WILLIAM F., M.E., has been appointed assistant engineering officer at an army flying school. He was commissioned a lieutenant on January 10, 1912.

1941

ANDERSON, G. M., M.E., is a lieutenant and an engineering officer in the air service.

BRIERLEY, JOHN W., Ch.E., who is plastic engineer for the Bakelite Corporation, 230 North Grove Street, Bloomfield, New Jersey, lives at 154 Franklin Street, Bloomfield, New Jersey.

DONOGHUE, JOHN J., C.E., is employed as stress analyst by the Stinson Airplane Company, Wayne, Michigan. His home address is 1115 Forest Avenue, Ann Arbor, Michigan.

FALK, SAMUEL ODIN, Ch.E., is a methods engineer with the Revere Copper and Brass Inc., Fullerton and Grand Avenue, Chicago. His home address is 3335 W. Diversey Avenue, Chicago.

GOETZ, LEROY A., C.E., is a student engineer, structural steel department, Box 1230 Diablo Heights, Canal Zone. His home address is 6210 South Troy, Chicago. He states that the following men are also working in the Canal Zone with him. Frederick Holle, M.E., '40; Ian Ikenn, C.E., '37; Robert Knabe, C.E., '36; Robert Saigh, C.E., '41; and Ivan Thunder, C.E., '37.

HARMON, ROBERT H., F.P.E., is a student engineer, office engineering division, department of operation and maintenance, Panama Canal. His address for mail is General Delivery, Ancon, Canal Zone.

JOHNSON, WALLACE A., M.E., who is a junior engineer in the employ of the General Electric Company, East Cleveland Lamp Works, Nela Park, Cleveland, Ohio, resides at 3799 Lowell Road, Cleveland Heights, Ohio.

KASPER, LOUIS R., E.E., is employed as testing engineer by the Wisconsin Steel Works, 106 and Torrence, Chicago. He lives at 6210 South Fairfield, Chicago.

Kirkland, John T., C.E., is an engineering trainee at the Lockheed Aircraft Corporation, Burbank, California. His home address is 12 Reinway Court, Pasadena, California.

Langtry, Edwin R., M.E., a tool engineer with the Reliable Tool and Die Company, 734 Mount Elliott, Detroit, Michigan, is living at 1508 Glendale, Detroit, Michigan.

Levinson, Harry, E.E., who is a tool designer for the Boeing Aircraft Company, Seattle, Washington, resides at 5213 Twelfth Avenue, N.E., Seattle, Washington. Levinson is studying aerodynamics at the University of Washington. He informs us that Frank Miller, Ch.E., '40, is a lieutenant in the Army Air Corps.

Link, Peter J., M.E., is a design engineer for the Kimberly-Clark Corporation, Packard Road, Niagara Falls, New York. His home address is 304 Buffalo Avenue, Niagara Falls, New York. Link informs us that Roy E. Jacobsen, C.E., '41, and he are working together.

Matson, Elmer A., M.E., who is a junior engineer with the Commonwealth Edison Company, 72 West Adams Street, Chicago, lives at 7147 South East End Avenue, Chicago. He writes that Thomas F. McKeon, M.E., '41, has a similar position with the Edison Company.

Mueller, Robert L., Ch.E., is a chemist with E. I. Dupont de Nemours, Box 525, Wilmington, Delaware. He is also teaching defense training courses in connection with Drexel Institute at Philadelphia.

Murray, James W., M.E., recently changed his address to 16 Walnut Terrace, Bloomfield, New Jersey.

Ramp, Robert L., E.E., is employed at the Naval Research Laboratory in the special development section of the radio division, Washington, D. C. His address is 6514 Brennon Lane, Chevy Chase, Maryland.

Riggs, D. T., E.E., is employed as frameman by the Illinois Bell Telephone Company, 1310 West Monroe Street, Chicago, and lives at 6416 Kimbark Avenue, Chicago.

Stein, Charles R., M.S., is a chemist with the Yale Oil Corporation, Billings, Montana. His home address is 224 North 24th Street, Billings, Montana.

Wasz, Eugene P., M.E., is an engine tester with the Electromotive Corporation, La Grange, Illinois. He is now residing at 2326 North McVicker Avenue, Chicago.

Wessel, Henry E., Ch.E., who is a chemist with the Monsanto Chemical Company, plant II, Cottage Toll Road, Norfolk, Virginia, married Miss Charlotte Bachman of Chicago on September 20, 1941. They are now residing at 113½ Rockbridge Street, Norfolk, Virginia.

1942

Adams, Harold Porter, M.E., is employed by Republic Flow Meters Company, 2240 W. Diversey Avenue, Chicago. He resides at 2234 Logan Boulevard, Chicago.

Alderson, Henry Grey, M.E., is employed by Public Service Company, Maywood, Illinois. He resides at 7133 S. Rockwell Street, Chicago.

Andersen, Anders Krist, M.E., resides at 4300 N. Hamlin Avenue, Chicago.

Anderson, Edward Alberg, M.E., is employed by Carnegie-Illinois Steel Corporation, 3426 E. 89th Street, Chicago. He resides at 10712 Avenue F, Chicago.

Armstrong, Edward, M.E., resides at 526 Thatcher Avenue, River Forest, Illinois.

Berg, Howard L., M.E., is employed by The Chicago Screw Company, 1026 S. Homan Avenue, Chicago. He resides at 1509 N. Mayfield Avenue, Chicago.

Bickell, Donald Dixon, M.E., is employed by Inland Steel Company, East Chicago, Indiana. He resides at 1109 Beacon Street, East Chicago, Indiana.

Bickell, Gilbert J., M.E., is employed as junior draughtsman, Inland Steel Company, East Chicago, Indiana. He resides at 443 Conkey Street, Hammond, Indiana.

Boardman, Fred Charles, M.E., resides at 1031 W. Bryn Mawr Avenue, Chicago.

Boaco, William David, M.E., resides at 711 Wood Street, Texarkana, Arkansas.

Boyer, Charles P., M.E., is employed by Webster-Chicago Corporation, 5622 W. Bloomingdale Road, Chicago. He resides at 3531 Fifth Avenue, Chicago.

Cirira, Stephen, M.E., was inducted into the army February 19, 1942. His residence is at 2814 W. 23rd Place, Chicago.

Cuculic, Louis Thomas, M.E., is employed by American Steel Foundries, East Chicago, Indiana. He resides at 3821 Main Street, East Chicago, Indiana.

Cunny, Walter Frederick, M.E., is employed as acting superintendent, B. F. Gump Company, 431 S. Clinton Street, Chicago. He resides at 1641 Edgewater Avenue, Chicago.

Cuthbert, Charles H., Ch.E., resides at 532 20th Street N. W., Washington, D. C.

Danson, John O., M.E., is employed by Felt & Tarrant Manufacturing Company, 1735 N. Paulina Street, Chicago. He resides at 7316 S. Aberdeen Street, Chicago.

Delany, B. Pearson (Mrs. John B.), M.E., resides at Sutton Road, Barrington, Illinois.

Dillon, John Francis, C.E., resides at 2947 S. Halsted Street, Chicago.

Emrath, George Russel, E.E., resides at 6704 N. Hermitage Street, Chicago.

Erickson, Roy Edwin, M.E., is employed by Danly Machine Specialties Company, 2404 S. 52nd Avenue, Cicero, Illinois. He resides at 829 Cornelia Avenue, Chicago.

Fischer, Henry Robert, M.E., is employed by Ilg Electric Ventilating Company, 2850 N. Pulaski Road, Chicago. He resides at 7323 Lunt Avenue, Chicago.

Fitch, Charles Vaughan, M.E., resides at 5308 S. Neva Avenue, Chicago.

Gibney, Robert D., M.E., is employed by American Steel Foundries Company, Hammond, Indiana. He resides at 907 W. 111th Street, Chicago.

Glass, Raymond E., E.E., is employed in the engineering department, radio division, Westinghouse Electric & Manufacturing Company, 2509 Wilkens Avenue, Baltimore, Maryland. He resides at 202 Beechwood Avenue, Catonsville, Maryland.

Groen, William, M.E., is located at Fort Schuyler, Schuyler, New York. His residence is at 820 N. Grove Avenue, Oak Park, Illinois.

Grote, Jr., Frank Richard, M.E., is employed by American Can Company, Maywood, Illinois. He resides at 2554 N. New England Avenue, Chicago.

Hanneman, Richard Louis, M.E., is located at Fort Schuyler, Schuyler, New York. His residence is at 1522 Thome Avenue, Chicago.

Hanuska, Edward Paul, M.E., is employed by Goodman Manufacturing Company, 4834 S. Halsted Street, Chicago. He resides at 6653 S. Claremont Avenue, Chicago.

Hayes, Dudley Ward, M.E., is employed by Bell & Howell Company, 4045 N. Rockwell Street, Chicago. He resides at 3325 W. 63rd Place, Chicago.

Hoffman, Russell Richard, M.E., is employed by Interlake Iron Corporation, 11236 S. Torrence Avenue, Chicago. He resides at 8005 Ingleside Avenue, Chicago.

Jasis, Jr., Peter, M.E., is employed by American Steel Foundries, East Chicago, Indiana. He resides at 4935 S. Komensky Avenue, Chicago.

Kahn, Marshall, Ch.E., resides at 7618 Kingston Avenue, Chicago.

Kallas, Roy Harvey, M.E., is employed by Revere Copper & Brass, Inc., 6630 Fullerton Avenue, Chicago. He resides at 624 S. Tripp Avenue, Chicago.

Kocourek, Robert S., M.E., is employed by Foote Brothers Gear & Machine Corporation, 5301 S. Western Avenue, Chicago. He resides at 384 Kent Road, Riverside, Illinois.

Koenig, Paul R., M.E., is employed as engineer by the Metal & Thermit Corporation, 415 E. 151st Street, East Chicago, Indiana. He resides at 6756 Wentworth Avenue, Chicago.

Kozica, William Stephen, M.E., is an ensign in a Naval Training School. His residence is at 5240 S. Troy Street, Chicago.

Kraegel, Martin William, M.E., is employed as assistant works engineer for the American Steel Foundries, 4831 Hohman Avenue, Hammond, Indiana. He resides at 2509 Indiana Avenue, Oak Glen, Illinois.

Krueger, Walter Otto, Ch.E., resides at 5927 S. Mozart Street, Chicago.

Loben, William Elmer, is employed as assistant to work's manager, Whiting Corporation, Harvey, Illinois. He resides at 10212 S. May Street, Chicago.

Lombard, Charles J., M.E., is employed as mechanical engineer for the Danley Machine Specialties, Inc., 2100 S. 52nd Avenue, Cicero, Illinois. He resides at 815 W. Addison Street, Chicago.

McGinnis, Faank Darrel, M.E., resides in Willow Springs, Illinois.

McMillan, William Robert, Ch.E., is employed as teaching assistant, Carnegie Institute of Technology, Box 291, Pittsburgh, Pennsylvania.

Mangan, John Richard, M.E., is employed as engine tester for the Buda Company, Harvey, Illinois. He resides at 8430 Euclid Avenue, Chicago.

Manstrom, William E., M.E., is employed by Miehle Printing Press & Manufacturing Company, West 14th and South Damen Avenue, Chicago. He resides at 6508 Lowe Avenue, Chicago.

Miles, George Nathan, M.E., is employed as student engineer, General Electric Company, Fort Wayne, Indiana. He resides at 1221 W. Wayne Street, Fort Wayne.

Milewski (Miller), Victoa T., M.E., announces that he has recently changed his name to Victor T. Miller. He resides at 7234 S. Talman Avenue, Chicago.

Noyes, Richard Apps, M.E., is employed as engineering trainee, McDonnell Aircraft Corporation, Lambert Field, St. Louis, Missouri. He resides at 5534 Bartmer Avenue, St. Louis, Missouri.

Olchawa, Joseph M., M.E., resides at 2323 W. Cullerton Street, Chicago.

Partlow, James Edward, M.E., is in the United States Navy. His residence is at 9045 S. Carpenter Street, Chicago.

Post, George Murray, M.E., is employed as research engineer, National Advisory Committee for Aeronautics, Langley Field, Virginia. He resides at 137 Chesterfield Road, Hampton, Virginia.

Powell, Walter John, M.E., resides at 118 Park Street, Whitewater, Wisconsin.

Paikos, Paul H., M.E., is residing at 4216 Bermuda, Ocean Beach, San Diego, California.

Rapp, John William, M.E., is employed by Foote Brothers Gear & Machine Corporation, 5301 S. Western Avenue, Chicago. He resides at 1507 E. 69th Street, Chicago.

Rieder, Rudy A., M.E., is employed by Whiting Corporation, Harvey, Illinois. He resides at 913 W. 86th Street, Chicago.

Sandusky, Paul Marvin, M.E., is located at Fort Schuyler, Schuyler, New York. His residence is at 159 E. 111th Street, Chicago.

Sherman, Milton, Ch.E., resides at 3304 Lexington Street, Chicago.

Simpson, William M., C.E., is employed in the civil engineering department, University of Missouri, Columbia, Missouri.

Snowdon, Donald Rossiter, M.E., is employed as research engineer, Chicago Transformer Company, 3501 W. Addison Street, Chicago. He resides at 6610 N. Maplewood Avenue, Chicago.

Spierer, William Z., E.E., resides at 2224 W. Division Street, Chicago.

Staroba, John Emil, M.E., is employed by the Chicago Screw Company, 1026 S. Homan Avenue, Chicago. He resides at 2458 S. Spaulding Avenue, Chicago.

Stone, Daniel Victor, M.E., is employed by Revere Copper & Brass, Inc., Chicago. He resides at 3444 Drummond Place, Chicago.

Streit, Clarence Theodore, M.E., is an ensign, United States Naval Academy post-graduate school, Annapolis, Maryland. His residence is at 233 Prince George Street, Annapolis, Maryland.

Stryz, Hillard Charles, M.E., is employed by Pyle-National Company, 1334 N. Kostner Avenue, Chicago. He resides at 6914 S. Western Avenue, Chicago.

Stuchell, Ralph Bernhard, M.E., resides at 2031 Summerdale Avenue, Chicago.

Sullivan, John P., M.E., is employed as field representative, Firestone Tire & Rubber Company, Akron, Ohio.

Swanson, Carl A., M.E., resides at 6549 S. Seeley Avenue, Chicago.

Swedler, James William, M.E., is employed by Western Electric Company, Cicero, Illinois. He resides at 5727 W. 22nd Place, Cicero, Illinois.

Taufen, Harvey James, Ch.E., is rn instructor in chemistry, Illinois Institute of Technology, 3300 Federal Street, Chicago. He resides at 4465 Ellis Avenue, Chicago.

Till, Fred, M.E., resides at 3841 W. Adams Street, Chicago.

Valaitis, Anthony Frank, M.E., is employed by Western Electric Company, Cicero, Illinois. He resides at 3014 W. 63rd Street, Chicago.

Vander Hulst, E. W., M.E., is a corporal in the Field Artillery.

Walsh, Thomas M., M.E., is employed by Republic Steel Corporation, Chicago. He resides at 7703 Ridgelrnd Avenue, Chicago.

Wasisco, Bernard Eugene, M.E., is em-

ployed by the Chicago Screw Company, 1026 S. Homan Avenue, Chicago. He resides at 1306 Albion Avenue, Chicago.

Welsch, Arthur Harry, M.E., resides at 814 S. Springfield Avenue, Chicago.

Westphall, Joseph Allan, M.E., is employed by American Steel Foundries, Chicago. He resides at 330 S. Spencer Street, Aurora, Illinois.

Wilrciak, Ted J., M.E., is employed by the Chicago Screw Company, 1026 S. Homan Avenue, Chicago. He resides at 2403 Moffat Street, Chicago.

Windstrup, Robert Franklin, M.E., is employed by Continental Can Company, 7600 S. Racine Avenue, Chicago. He resides at 4723½ Ellis Avenue, Chicago.

Wright, Chester Stephen, M.E., resides at 2430 W. Cullom Avenue, Chicago.

Wright, Norbert L., M.E., is employed by Templeton Kenly & Company, 1020 S. Central Avenue, Chicago. He resides at 2430 W. Cullom Avenue, Chicago.

DEVELOPMENT

(From page 4)

sociation on April 7, call for the designation of the coming year's contributions, at the discretion of the donor, for (a) the general building program, (b) the Carman Memorial Library, as a part of the Library and Administration Building, or (c) a Field House Fund, already amounting to more than $12,000, of which $10,000 was pledged by the Illinois Tech Students' Association last fall.

The proposed library will honor the memory of George Noble Carman, first director of Lewis Institute and its executive head for approximately forty years. As a part of the Library and Administration Building for the enlarged campus, this is well toward the top of the list of construction projects.

The proposed field house, to become the home of all physical education activities of the Institute, has long been a recognized need, and it is expected that its inclusion in the program for annual alumni giving will materially hasten its realization.

To carry the story of Tech's needs to industry in the Chicago area a formidable organization has been built up under Mr. McNulty's direction, and the solicitation of funds is being carried to firm prospects in a large number of industrial classifications.

A special message, addressed to industry by Wilfred Sykes, president of Inland Steel, Institute trustee and chairman of the Special Development Program Committee, stresses the opportunity for a real contribution to our nation's war effort through support of this program. It says in part:

"It is just over a year since the Board of Trustees announced a Spe-

cial Development Program designed to make Illinois Institute of Technology the outstanding technological center of the nation.

"Within a month of that announcement, cooperation with the Government in defense engineering training activities compelled the Institute to assume many additional and unforeseen responsibilities . . . under the already heavy handicaps imposed by inadequate plant and equipment.

"Now we are at war! Every other contribution which the Institute can make to youth, to industry, to this great midwest area and to the nation must now be measured in terms of the one it makes to VICTORY.

"The buildings so needed in the development of a service program under normal conditions have become absolutely essential to the achievement of today's most important objective . . . the contribution, in increasing numbers, of technologically trained men for our armed forces, and for that other army to operate the lines of production and supply behind them.

"The Government asks us to speed up our educational schedule. It urges us to accept more students in regular courses. Within the limits of plant and equipment we are doing so.

"In addition to some 6,000 students in regularly scheduled courses, the Institute has trained or is training twice that number of men and women in special subjects as part of the VICTORY program. When war broke out on December 7, last, 8,659 had enrolled in such courses.

"As of April 1, 1942, there were some 4,300 men and women entered in 52 courses of the Engineering, Science and Management Defense Training program, in addition to 133 women who are being specially equipped for war work in industry.

"Today, demands for increased enrollments in a steadily expanding VICTORY program must be met!

"Now . . . not tomorrow . . . we must act. All our effort, our time, our money must be enlisted in the common cause of VICTORY.

"Already each of us is making a definite contribution. Through taxes, by the purchase of bonds, in contributions to the Red Cross, to Army and Navy Relief, to the USO and the like, we seek to do our part.

"But such investments in the VICTORY program, important as they are, cannot provide what is perhaps the most vital addition to our war effort . . . that of the technologically trained men upon whom VICTORY so largely depends.

"Your money invested in VICTORY through Illinois Institute of Technology becomes payable to our country in MANPOWER, trained to make the greatest single contribution toward winning this war, as well as toward the winning of an enduring peace in an increasingly technological world."

Alumni and faculty members at work in this industrial solicitation include William H. Beattys, Jr., Armour '99, as chairman for the Heavy Industry Division, associated with whom are Sidney B. Westby, Lewis '33, Professor L. J. Lease, Rupert J. Geisler, Armour '12, Peter V. Martin, Armour '38, C. M. Myers, Armour '25, Clyde E. Peaster, Armour '29, William T. Dean, Armour '00, William F. Finkl, Armour '18, R. A. Wight, Armour '07, Harlow H. Belding, Armour '10, Everett D. Kaser, Armour '11, and F. L. Brewer, Armour '14.

Working with Victor R. Clark, president of the Victor R. Clark Belting Company, who heads the Light Industry Division, are Hosmer H. Allyn, Lewis '10, Alexander I. Newman, Armour '24, M. A. Collick, Armour '33, L. B. Hamersley, Armour '25, William K. Lyon, Jr., Armour '21, R. F. Robinson, Lewis '17, Frank W. Canley, Armour '22, Jerrold Loebl, Armour '21, R. N. Friedman, Armour '11, James E. Higgins, Armour '30, E. Voita, Armour '25, Philip Harrington, Armour '06, C. W. Diemecke, Armour '15, Stuart R. Evans, Armour '17, and Hubert F. Rehfeldt, Armour '19.

Working in the Wholesale Division are L. C. Johnson, Lewis '36, Arthur Wagner, Sr., Armour '03, H. A. Baum, Armour '08, A. W. Coen, Armour '10, Kent H. Parker, Armour '28, A. J. Platt, Armour '17, T. F. Schmidt, Lewis '18, Carl N. Wolf, Lewis '07, Jack H. Lund, Armour '27, C. O. Frary, Armour '08, G. C. Carnahan, Armour '14, and Verner A. Hedlund, Armour '35.

In the Foods Division, under the chairmanship of Franklin M. deBeers, Armour '05, alumni leaders include Miles L. Friedman, Lewis '03, and C. Robert Moulten, Lewis '03.

C. Paul Parker, Lewis '10, heads the Professional Division, and among those associated with him are Elmer A. Wegner, Armour '32, Paul Mullaney, Armour '23, and W. W. Ege, Lewis '25.

The chairman of the appeal's General Division is Walter Painter, Lewis '15, and among those associated with him are Victor E. Marx, Armour '16, George S. Allison, treasurer of the Institute, Samuel Neal Abrams, Armour '16, Orlando H. Alger, Armour

'21, William W. Gothard, Armour '27, Charles M. Nelson, Armour '26, A. J. Platt, Armour, '17, John J. Schommer, Armour '12, Harold J. Rogan, Lewis '30, and Paul J. Schrader, Lewis '10.

PUBLIC HEALTH

(From page 12)

the view of enclosing the processes as completely as possible, the more efficient will be the results.

Too frequently it is found that the minor inconveniences produced by requiring an employe to rearrange his movements for the purpose of completing an operation have been used as an excuse to avoid closed hooding. When only partially-enclosed equipment for manufacturing processes proves to be impractical, the engineer may resort to general ventilation for controlling the air environment. This is the least efficient way of controlling gases, fumes, and dust dangerous to health.

The engineer also must bear in mind that substances are frequently used in industry which are skin irritants, and these often cause skin inflammation. He may be able to provide substances which serve the same purpose as those which are skin irritants, but which do not affect the skin. In the control of infectious agents, such as, for example, anthrax in the slaughtering and hide industry, the engineer must resort to the sterilizing of hair that may carry the infecting agent. He may use autoclaves and similar devices for sterilizing the contaminated material, so that the hair is rendered no longer dangerous to health.

In his effort to prevent public health nuisances, which emanate from industry and affect not only the individuals immediately adjacent to manufacturing operations but also those farther away, the engineer must provide for a collecting apparatus which can do a reasonably effective job. He should not take the position that the air surrounding the city is a great reservoir for diluting harmful substances. When this happens, both the neighbors of industry and the management are frequently faced with a nuisance.

When the technical knowledge of the engineer is judiciously applied to this form of public health control, not only is there abatement of nuisances, but often the harmful substances, when collected, have a commercial value which, at least in part, may reimburse industry for its effort.

There are certain other physical characteristics of man's environment having to do with light, heat, and other energy emissions which must be controlled if plant employes are to be kept healthy. Shielding or insulating is the answer to the control of such conditions. In the blast furnace industry, shields placed between the employe and excessive sources of heat greatly mitigate the number of heat strokes. Light, particularly of the shorter wave lengths, may necessitate guarding the employes from direct exposure to rays. An intimate knowledge of physics, chemistry, and the other sciences, as well as meticulous attention to details, will bring about a satisfactory solution of these problems.

The engineer and the physician are intimately associated in the problem of public health. A well-thought-out cooperative plan of action will bring about the best results for both plant management and employe. The physician will welcome suggestion from the engineer in matters that have to do with the health of the men in the plant. The physician in industry cannot be expected to have the answers to all the problems involving adequate protection of the employe, consistent with the restrictions imposed by the plant management. The physician is always willing to help the engineer in studying the effect of industrial operations upon the employe and, in cooperation with the engineer, to solve such problems in a rational, common-sense way. As a result of cooperative effort on the part of physician and engineer, much can be done to improve the health status of the employe without unduly increasing the cost of industrial operations.

The time lost to industry and the productive capacity of our country by illness, when estimated in man-days, is large. At this time, when national defense is so important, as well as in periods of peace, when the commercial needs of our people outdistance industrial production, it is not only important but essential that absenteeism from industry, caused by sickness, be reduced to a minimum.

When individuals are absent from their tasks, not only is time lost directly by the employe, but his absence also affects the efficiency of others.

WASTE

(From page 19)

conservatives, that the war effort began to prosper.

In this country, working people and their unions, even though some of them are very busy grinding private axes, view this war as their war and feel that they should have a voice in it. We have Reuther plans, Murray plans, for the cooperation of labor, capital and government. If serious difficulties are met in the conduct of the war, as they may be met, we are likely to be reminded that proposals were made, and were not heeded. Few thoughtful employers would deny, I think, that management as a whole suffered in public opinion in the period from, say, 1924 to 1934. Many of our troubles with restrictive labor legislation reflect the lack of confidence of the general public in the business leadership of the thirties.

Now it is found, in time of need, that management has its part to play. Logically, for effective action, any organization must head up to one point for decisions, for coherence in planning. As Vauclain said, "Business is not a debating club." But let us not forget that the stage of counsel precedes the stage of decision, and that, in the stage of counsel, all who have ideas should be heard, if for no other reason than that they may consent to the decision.

How this counsel may be taken is a matter for each plant to determine. In some, the union furnishes the natural forum for discussion, and one source of committee memberships. In others, where management has long had the habit of listening before it speaks, as good or better results may be secured without formal organization, by individual rather than collective discussion.

Management can help to provide an expression of the urge to do something about the war by helping employees to organize for such patriotic activities as the home collection of scrap, Red Cross nursing and first aid courses, and the like. The war presents a special opportunity for a wise management to strengthen the bonds of mutual confidence with employees by the wise direction of a program which commands the respect and support of its employees.

There are signs, such as slowdowns, that not all managements have succeeded in securing the confidence of their organizations. At a time when every man feels the urgency of the need, an integrated program of economy of resources, with parts of the program delegated to competent people for planning and follow-up, can do much to strengthen the position of management with its people and with the community. Important as such a program is to the war effort, it may be even more vital as a foundation for the post-war period.

MOUSE TRAPS

(From page 20)

room is full of sound, the source is cut off and the time required for this sound to die away to a lower standard intensity is carefully measured to hundredths of a second, using microphones, amplifiers, and split-second synchronous clocks. This time interval for the room, with and without the material present, must be determined. Then, by proper mathematical manipulation, a numerical value for the absorption coefficient is obtained. (Sometimes 125 percent).

The space occupied by the reverberation chamber is large. Since no person can be present in the room itself during testing, an additional room is required to house the measuring equipment. Variations in humidity and temperature seriously affect the results. Many square feet of sample are required. The agreement of results obtained by the same method of measurement in different reverberation chambers is very poor.

We do need a better mouse trap. The Armour Research Foundation is perfecting a method of measurement, which, while not at all new (about sixteen years old), has never been appreciated until recently. This method consists of placing a sample of the material at one end of a tube and generating a plane wave of sound normal to the axis of the tube at the other end by means of an oscillator and loudspeaker setup similar to that used in the reverberation-chamber method. This arrangement sets up a standing wave pattern within the tube, consisting of a series of "loops" and "nodes" or points of maximum and minimum sound pressure, much like the waves set up in a rope attached to a fence post when a small boy vigorously shakes the other end. These pressure maxima and minima are measured by a microphone which explores the tubes from end to end. Then by proper mathematical manipulation, the sound absorption coefficient of the material is determined. (Values over 100 percent are not possible under this method of test.)

Note the advantages of this latter system. First, all the equipment occupies but little space—15′ x 3′ x 4′ at the most. Variations of temperature and humidity are not as critical and do not require as long a time to become uniform in a tube one foot square and twelve feet long as they do in the huge room. Only one square foot of the sample is required. Sometimes even a three-inch circular piece is sufficient. This is of distinct advantage in the frequent checking of mill runs, or the development of new materials when large quantities of material are usually an economic impossibility. The test results thus far obtained from other tubes in various parts of the country are in excellent agreement.

One reason the tube method has not been used more widely up to the present is that the samples usually tested have been too small, and not mounted as they would be in actual practice; this has led to some erroneous results at low frequencies, although the high-frequency measurements have been satisfactory. This would indicate that the method of mounting the sample should be improved. This has been done at the Armour Research Foundation. A standard full-sized sample (12″ x 12″) is used for the test, and lends itself to mounting in a manner comparable to that used in practical installations.

In the field of heat and thermal conductivity, the reputation of the work carried on by the Foundation is widely known and firmly established. This new parallel service in the field of sound promises to become equally useful to industry.

R. J. Tinkham.

GOOD NEIGHBORS

(From page 22)

now are tungsten, zinc concentrates, and several other vital minerals. Other Argentine articles which formerly had no sale here and which now are beginning to be shipped in large quantities include: tanned leather and leather goods, cheese, packing-house by-products, eggs, vermouth and champagne. Also, new Argentine products in which the United States is interested are beginning to be offered for sale.

The broad objective of the Argentine Trade Promotion Corporation, according to one of its representatives, is the increasing of Argentine exports to the United States so that additional exchange may be created with which the Argentine may pay for increased imports from America. This, Argentina feels, is the soundest approach to its problem of past years when it usually had an adverse trade balance with the United States.

The entire administration of the corporation is in the hands of business men, for, while formed by a special

government decree, the ATPC is an independent organization. It is composed of a large number of stockholders who are active in exporting and importing, and in manufacturing and commerce.

Eight United States citizens and three Argentines make up the officers and the directors of the corporation. They are:

President: Leo D. Welch, supervisor of River Plate Branches of the National City Bank of New York.

Vice-President: H. T. Bettle, managing director of General Motors Argentina, S. A.

Secretary: E. Carbone of Carbone, Goffre and Cia.

Treasurer: R. D. Spradling, president of the American Chamber of Commerce and president of Armco Argentina, S. A.

Pro-Treasurer: H. A. Driscoll, manager of the First National Bank of Boston.

Directors: C. P. Batchelder, president of General Electric S. A.; E. P. Clarendon, sub-manager of Moore and McCormack; J. Fevre of Fevre and Basset; F. F. Griffith, manager of the Ford Motor Company of Argentina; A. S. Millard, manager of J. I. Case Company; and L. Fiore of Fiore and Company.

The appointment of the Armour Research Foundation to make this industrial survey is the first major step toward the goal of the Argentine Trade Promotion Corporation.

Naturally, therefore, the survey has important national significance — an importance reflected by the nationwide publicity given the announcement of the survey.

PAUL O. RIDINGS

E. S. M. D. T.

(From page 26)

training, metallurgy, plastics, and more than eighty others.

They studied in a total of 125 divisions, some of the courses including as many as 25 separate divisions, each emphasizing a different phase of the general course.

All the programs except two have been evening classes. One of the two was a full-time day course in airplane-engine production, running during the summer of 1941. Nine hundred sixty men finished the course, and practically the entire number were immediately utilized for defense production by one corporation.

The second full-time day program was in ordnance and instruction. One hundred seventy-eight persons took the sixteen-week program and then entered into ordnance work.

In fact, almost the entire number of persons trained in the Ill. Tech programs, except the 960 trained in airplane-engine production, have been placed in positions in the Chicago Ordnance Area.

THE SCHOOLMASTER

(From page 34)

have *descended*. Not through our own choice. But here we are, and with all the strength of mind and body that we have, we must fight our way upward. We know our enemies. We understand their strength. One of their weaknesses is that they can not really understand our strength.

May we return to Einstein, and to the "up" and "down," the "ascent" and "descent," which started these meditations? The schoolmaster becomes again an engineer, who is thinking at the moment of the world down under. Of course we know that in Melbourne and in Chicago people whose heads are up have different ideas about what upness means. Literally. Not figuratively. In both places "Heads up" means the same thing when it implies things of the spirit.

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JUNIOR CHEMISTS NEEDED

War demands have created unusual opportunities for technically trained persons in Federal employment. The United States Civil Service Commission is now seeking Junior Chemists to perform research, investigative, or other work in some branch of Chemistry. The positions pay $2,000 a year. No written test is required. Applicants' qualifications will be judged from their experience, education and training.

Women especially are urged to apply. The Navy yards, arsenals and other Government laboratories, it is reported, are now employing women in chemical work. Completion of a four-year course in a recognized college with thirty semester hours in chemistry is required, although senior students who will complete the required course within four months of the date of filing application may apply. No experience is required, although preference in appointment may be given to applicants showing experience in chemical or related work.

There are no age limits for this examination. Applications must be filed with the Civil Service Commission, Washington, D. C., and will be accepted until the needs of the service have been met.

Application forms and further information regarding this and other opportunities open to chemists in the Federal Government may be obtained at first- and second-class post offices throughout the country.

PRE-ENGINEERING PROGRAM

To help offset the United States' dire shortage of trained engineering personnel, Illinois Institute of Technology has arranged to increase its supply of incoming engineers by about twenty per cent next fall through the establishment of a special pre-engineering program.

The pre-engineering program will take a group of selected boys who are now high school juniors—completing either the sixth or seventh semester of high school now—and prepare them for admission into the engineering college next fall.

The boys, who will be selected on the basis of personal interviews and competitive examinations, will be given thirteen weeks of intensive study in American Institutions, English, Engineering Orientation, Mathematics and Physical Science Survey this summer, and this work will supplant their senior year in high school.

Upon successful completion of this course, the boys will then be admitted as freshmen at Illinois Tech with the regular incoming class next fall.

"With our nation in dire need of many times more engineers than can possibly be trained, we felt that some steps must be taken to speed up the supply of engineers," says President Heald. "This spring all of the nation's engineering colleges will graduate less than ten per cent of the number of trained engineers now needed."

President Heald points out that what the country needs is fully trained engineers and that there is no way in which engineering training can be arbitrarily shortened.

This is why it is unsafe to admit high school juniors directly into engineering colleges, as can be done by other schools, President Heald explains. "Therefore," he says, "we adopted this pre-engineering program, which will make no sacrifice in training, and yet which will increase our supply of incoming engineers to our physical limitations."

Illinois Tech's pre-engineering program will make it possible for the boys selected to complete the high school-college span in six and one-half years instead of the customary eight, as Illinois Tech is already using an accelerated program which enables the student to graduate in three and one-half years.

The pre-engineering summer session will begin about June 28 and will continue until the opening of school in September. J. C. Peebles, dean of the Armour College of Engineering of Illinois Tech, is directing the selection of the juniors and expects to complete this selection by May 10.

WATCH FOR NOTICE OF SPRING MEETING OF ARMOUR ALUMNI ASSOCIATION

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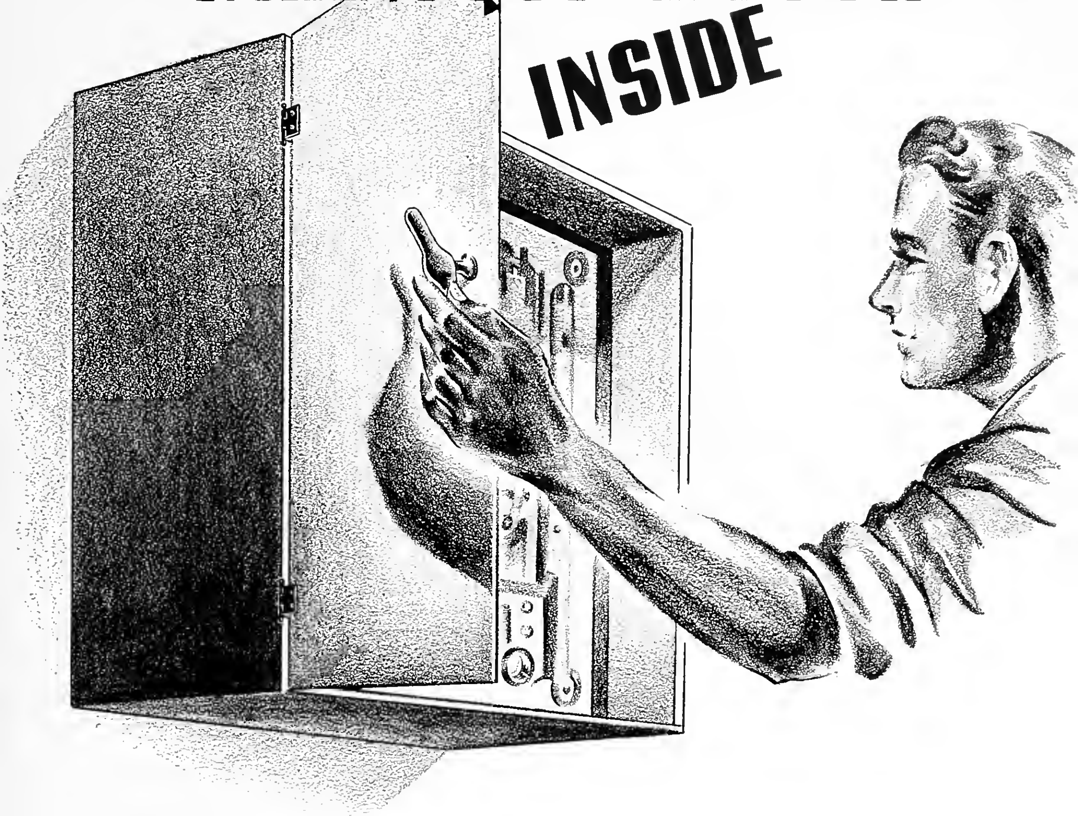

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